LEP: 12TH BIOLOGY
SESSION – 2025-26
INDEX

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BIOLOGY BLUE PRINT AND SYLLABUS
SESSION 2025-26

UNIT	Chapter	Sec A 1 mark	Sec B 2 mark	Sec C 3 mark	Sec D 5 mark	Total 70
6. REPRODUCTION	1. Sexual reproduction in flowering plants. 2. Human reproduction. 3. Reproductive health.	1 2 2	1 1 1 or 1 choice		1 or 1 (choice with C-2)	8 4 4
7. GENETICS AND EVOLUTION.	4. Principles of inheritance and variation. 5. The molecular basis of inheritance. 6. Evolution	1 1 1	1 or 1 choice 1	 1or 1choice 1	1 or 1 choice with C-4 or 5	8 4 6
8. BIOLOGY IN HUMAN WELFARE	7. Human health and disease. 8. Microbes in human welfare.	3 2	1 1	1		8 4
9. BIOTECHNOLOGY	9.Biotechnology: principles and processes 10.Biotechnology and its applications	2 1	1 or 1 choice 1	 1 or 1 choice with C-10		4 6
10. ECOLOGY	11. Organisms and Populations. 12. Ecosystem. 13. Biodiversity and conservation.	1 1 2	 1 or 1 choice with C-13	1	1 ques will be from C-12 (comprehension)or Q from C-13	4 8 2
TOTAL		20	20	15	15	70

CHAPTER: 1- SEXUAL REPRODUCTION IN FLOWERING PLANTS

Sexual reproduction in flowering plants involves the formation of male and female gametes in the stamens and pistil respectively. Pollination is the transfer of pollen grains from the anther to the stigma, which can occur through agents like wind, water, or insects. After pollination, fertilization takes place when the male gamete fuses with the egg to form a zygote, while another male gamete fuses with polar nuclei to form endosperm (double fertilization). The zygote develops into an embryo, and the ovule transforms into a seed, while the ovary becomes a fruit. This process ensures genetic variation and continuity of plant species.

A. MULTIPLE CHOICE QUESTIONS:

1. The function of tapetum is:

A) Nourishment to developing pollen
B) Protection of ovule
C) Formation of embryo sac
D) Pollination

2. The exine of pollen grain is made up of:

A) Cellulose
B) Lignin
C) Sporopollenin
D) Pectin

3. Which cell of pollen grain forms pollen tube?

A) Generative cell
B) Vegetative cell
C) Tube cell
D) Microspore

4. The female gametophyte in angiosperms is called:

A) Ovule
B) Embryo sac
C) Megaspore
D) Nucellus

5. Double fertilisation is unique to:

A) Gymnosperms
B) Algae
C) Angiosperms
D) Bryophytes

6. The pollen tube usually enters the ovule through:

A) Chalaza
B) Funiculus
C) Integuments
D) Micropyle

7. A typical angiosperm embryo sac is:

A) 4-celled
B) 6-celled
C) 7-celled
D) 8-celled

8. Which structure develops into seed coat?

A) Nucellus
B) Integuments
C) Chalaza
D) Funiculus

9. The process of formation of male gametes is:

A) Microsporogenesis
B) Megasporogenesis
C) Microgametogenesis
D) Megagametogenesis

10. The pollen viability in cereals like rice and wheat is about:

A) 24 hours
B) 30 minutes
C) 1 week
D) Several months

11. Which part of ovule provides nutrition to embryo sac?

A) Integument
B) Chalaza
C) Nucellus
D) Funiculus

12. The ploidy of endosperm in angiosperms is:
A) Haploid B) Diploid C) Triploid D) Tetraploid

13. Autogamy occurs only if:
A) Flowers are bisexual B) Anthers and stigma mature simultaneously
C) Pollination agents are present D) Flowers are unisexual

14. Syngamy refers to:
A) Fusion of polar nuclei B) Fusion of male and female gametes
C) Fusion of two male gametes D) Fusion of embryo and endosperm

15. Which cell degenerates after fertilisation?
A) Zygote B) Antipodals
C) Endosperm D) Embryo

16. Embryo development begins with:
A) Transverse division of zygote B) Longitudinal division
C) Random cleavage D) No division

17. Which hormone is responsible for fruit development without fertilisation?
A) Auxin B) Gibberellin
C) Cytokinin D) ABA

18. Cleistogamous flowers ensure:
A) Cross pollination B) Genetic variation
C) Self pollination D) Apomixis

19. Polyembryony refers to:
A) Formation of multiple fruits B)Formation of many seeds
C)Formation of more than one embryo in a seed D)Development of embryo without fertilisation

20. In dicot seeds, food is stored mainly in:
A) Endosperm B) Cotyledons C) Testa D) Pericarp

B. FILL IN THE BLANKS:
21. The outer wall of pollen grain is called _____.
22. Fusion of two polar nuclei is known as _____.
23. The central cell contains _____ nuclei before fertilisation.
24. A mature embryo sac has _____ cells.
25. The stalk of ovule is called _____.

C. STATE WHETHER TRUE / FALSE:
26. Sporopollenin is resistant to high temperature.
27. Endosperm is formed before embryo.
28. Nucellus degenerates completely in all seeds.
29. Pollen tube carries two male gametes.
30. Antipodal cells are nutritive in function.

D.TWO-MARK QUESTIONS:

31. What is meant by monosporic development in the female flower?
32. What is self-incompatibility? Why does self-pollination not result in seed formation in self-incompatible species?
33. Why do you think the zygote remains dormant for some time in a fertilized ovule?
34. Why is an apple considered a false fruit?
35. What is apomixis? Explain its importance.

E. FIVE-MARK QUESTIONS:

36. Given is the microsporangium of mature anther:
i. Name a, b and c layers.
ii. What is the function of microspore mother cell?
iii. What is the role of layer 'c'?
37. With a neat labeled diagram, describe the parts of a typical angiospermic ovule.
38. With a neat labeled diagram, explain 7 celled, 8 nucleate nature of female gametophyte.
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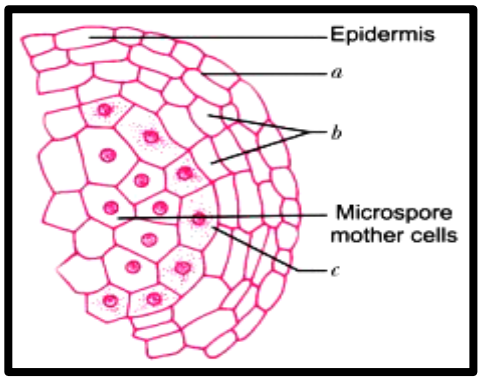

ANSWER KEY:

A. MULTIPLE CHOICE QUESTIONS:

A | 2 C | 3 B | 4 B | 5 C | 6 D | 7 C | 8 B | 9 C | 10 B |
11 C | 12 C | 13 B | 14 B | 15 B | 16 A | 17 A | 18 C | 19 C | 20 B

B .FILL IN THE BLANKS:

21 Exine | 22 Secondary nucleus | 23 Two | 24 Seven | 25 Funiculus

C. STATE WHETHER TRUE / FALSE:

26 True | 27 True | 28 False | 29 True | 30 True

CHAPTER: 2 - HUMAN REPRODUCTION

Human reproduction is the process by which male and female gametes unite to form a new individual. In males, the testes produce sperm and hormones, while in females; the ovaries produce ova and regulate the menstrual cycle. Fertilization occurs when a sperm fuses with an ovum in the fallopian tube, forming a zygote. The zygote undergoes development in the uterus, where it implants and grows into an embryo and then a fetus. This process results in the birth of a baby, ensuring continuity of the human species.

A. MULTIPLE CHOICE QUESTIONS:

1. The hormone responsible for initiation of spermatogenesis is

A) Testosterone B) FSH
C) LH D) GnRH

2. Which cell layer of seminiferous tubules provides nutrition to germ cells?

A) Leydig cells B) Sertoli cells C) Spermatogonia D) Myoid cells

3. Acrosome of sperm is derived from
A) Golgi apparatus B) Mitochondria C) Nucleus D) ER

4. The hormone that maintains corpus luteum during early pregnancy is
A) Progesterone B) Estrogen C) hCG D) Prolactin

5. Which structure prevents polyspermy in human ovum?
A) Zona pellucida B) Corona radiata
C) Vitelline membrane D) Plasma membrane

6. Menstrual cycle normally lasts for
A) 21 days B) 24 days C) 28 days D) 35 days

7. Ovulation generally occurs on which day of a 28-day cycle?
A) 7th B) 10th
C) 14th D) 21st

8. The fertilisation in humans normally occurs in
A) Ovary B) Uterus
C) Cervix D) Ampulla of fallopian tube

9. Which hormone is responsible for milk ejection?
A) Prolactin B) Estrogen C) Progesterone D) Oxytocin

10. Leydig cells are stimulated by
A) FSH B) LH C) Testosterone D) Inhibin

11. Cleavage divisions in humans are
A) Meiotic B) Mitotic
C) Amitotic D) Reductional

12. Implantation of blastocyst occurs in
A) Cervix B) Ovary C) Uterine endometrium D) Vagina

13. Which hormone inhibits FSH secretion in males?
A) Testosterone B) Inhibin C) Estrogen D) Progesterone

14. Which stage of spermatogenesis is haploid?
A) Spermatogonia B) Primary spermatocyte
C) Secondary spermatocyte D) Sertoli cell

15. Graafian follicle ruptures due to surge of
A) FSH B) Estrogen C) LH D) Progesterone

16. Placenta is connected to foetus by
A) Amnion B) Chorion C) Umbilical cord D) Yolk sac

17. The function of corpus luteum is secretion of

A) Estrogen only B)Progesterone only
C)Estrogen and progesterone D)FSH and LH

18. Which hormone prepares uterus for implantation?

A) Estrogen B) Progesterone C) Prolactin D) Oxytocin

19. Mammary glands become functional after

A) Puberty B) Menopause
C) Pregnancy D) Fertilisation

20. The gestation period in humans is about

A) 180 days B) 220 days C) 280 days D) 320 days

B .FILL IN THE BLANKS:

21. The outermost layer of uterus is called _____.
22. Human sperm contains _____ chromosomes.
23. The process of release of ovum is called _____.
24. _____ hormone is essential for spermiogenesis.
25. The embryo with 8 blastomeres is called _____.

C. STATE WHETHER TRUE / FALSE:

26. Sertoli cells secrete inhibin.
27. Menstrual cycle stops during pregnancy.
28. Fertilisation occurs in uterus in humans.
29. hCG hormone is detected in pregnancy test.
30. Progesterone causes thickening of endometrium.

D.TWO-MARK QUESTIONS:

31.State two roles of Sertoli cells in spermatogenesis.
32.Give two reasons why progesterone is essential during pregnancy.
33. Mention two differences between blastula and morula
34. Write any two functions of hCG hormone.
35. Write different parts of human sperm.

E. FIVE-MARK QUESTIONS:

36. Describe the process of spermatogenesis with hormonal regulation.
37. Explain the menstrual cycle with neat labelled diagram.
38. Describe fertilisation in humans including capacitation and cortical reaction.
39. Explain the process of oogenesis in humans.
40. Describe embryonic development with diagram.

ANSWER KEY:

A. MULTIPLE CHOICE QUESTIONS:

1 B | 2 B | 3 A | 4 C | 5 A | 6 C | 7 C | 8 D | 9 D | 10 B | 11 B | 12 C | 13 B | 14 C | 15 C | 16 C | 17 C | 18 B | 19 C | 20 C

B .FILL IN THE BLANKS:

21 Perimetrium | 22 23 | 23 Ovulation | 24 Testosterone | 25 Morula

C. STATE WHETHER TRUE / FALSE:

26 True | 27 True | 28 False | 29 True | 30True

CHAPTER: 3 - THE REPRODUCTIVE HEALTH

Reproductive health refers to the well-being of individuals in matters related to the reproductive system at all stages of life. It includes awareness about physical, emotional, and social aspects of reproduction and sexuality. Proper reproductive health care involves safe and hygienic practices, balanced nutrition, and access to medical services. Family planning methods help individuals and couples to have responsible and planned parenthood. Education and awareness about reproductive health prevent diseases and promote a healthy society.

A. MULTIPLE CHOICE QUESTIONS:

1. The major aim of reproductive health programmes in India is

A) Population explosion control B) Birth control only
C) Total reproductive well-being D) Family planning awareness

2. Which of the following is not a component of reproductive health?

A) Emotional well-being B) Physical health C) Social health D) Genetic engineering

3. The method that prevents ovulation by inhibiting LH surge is

A) Copper-T B) Barrier method C) Oral pills D) Vasectomy

4. The term "Saheli" refers to

A) Emergency contraceptive pill B) Non-steroidal oral contraceptive
C) Injectable hormone D) Copper releasing IUCD

5. Which hormone combination is used in combined oral contraceptive pills?

A) FSH + LH B) Estrogen + Progesterone
C) Estrogen + Oxytocin D) Progesterone only

6. Copper ions released by IUCD mainly

A) Kill sperms directly B) Prevent ovulation
C) Increase sperm motility D) Increase fertilisation rate

7. Which STD is caused by a protozoan?

A) Gonorrhoea B) Syphilis C) Trichomoniasis D) Genital herpes

8. Absence of symptoms in early stages is characteristic of

A) Gonorrhoea B) Syphilis C) HIV infection D) Genital warts

9. Which contraceptive is suitable for lactating mothers?

A) Combined oral pills B) Progesterone-only pills C) Copper-T D) Both B and C

10. Legal medical termination of pregnancy (MTP) is safest during

A) First trimester B) Second trimester C) Third trimester D) Any stage

11. Amniocentesis was banned in India mainly to prevent
A) Genetic disorders B) Female foeticide C) Infertility D) Population growth

12. Which disease is not transmitted sexually?
A) AIDS B) Hepatitis-B C) Filariasis D) Syphilis

13. Surgical sterilisation in males involves
A) Cutting vas deferens B) Removal of testes
C) Blocking urethra D) Removal of epididymis

14. Increased cases of infertility are linked with
A) Delayed marriage B) Stress and lifestyle changes
C) Environmental pollution D) All of the above

15. IVF stands for
A) Internal Vascular Fertilisation B) In Vivo Fertilisation
C) In Vitro Fertilisation D) Induced Vaginal Fertilisation

16. Which ART involves transfer of embryo with more than 8 blastomeres into uterus?
A) GIFT B) ZIFT C) IUT D) IVF-ET

17. The window period in HIV refers to
A)Time for viral replication B) Period between infection and symptoms
C) Time for antibody production D) Period of complete recovery

18. Which barrier method also protects against STDs?
A) Diaphragm B) Cervical cap C) Condom D) Copper-T

19. Social cause of sexually transmitted diseases includes
A) Poor hygiene B)Unprotected sex C) Multiple sexual partners D) All of the above

20. Which statement regarding reproductive health is correct?
A) It is absence of disease B) It includes only physical health
C) It ensures responsible sexual behaviour D) It focuses only on population control

B .FILL IN THE BLANKS:
21. _____ is the surgical method of contraception in females.
22. _____ hormone prevents ovulation in oral pills.
23. _____ STD damages immune system severely.
24. Government-initiated reproductive health programme in India is _____.
25. The transfer of zygote into fallopian tube is called _____.

C. STATE WHETHER TRUE / FALSE:
26. Vasectomy affects testosterone production.
27. Copper-T increases phagocytosis of sperms.
28. Syphilis is caused by a virus.
29. ART techniques help in treating infertility.

30. Reproductive health includes social well-being.

D. TWO-MARK QUESTIONS

31. Why sex education is necessary in schools?
32. Name two surgical methods of conception.
33. Write full form of ICSI and ZIFT.
34. Give two reasons of population explosion.
35. Name any two Assisted Reproductive Technologies and one use of each.

ANSWER KEY:

A. MULTIPLE CHOICE QUESTIONS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C	D	C	B	B	A	C	C	D	A	B	C	A	D	C	C	C	C	D	C

B .FILL IN THE BLANKS:

21 Tubectomy. 22 Progesterone. 23 AIDS. 24 RCH. 25 ZIFT

C. STATE WHETHER TRUE / FALSE:

26 False. 27 True. 28 False. 29 True. 30 True

CHAPTER: 4- PRINCIPLES OF INHERITANCE AND VARIATION

The chapter Principles of Inheritance and Variation explains how traits are passed from parents to offspring. Gregor Mendel conducted experiments on pea plants and established the basic laws of inheritance. According to Mendel's law of segregation, traits are controlled by pairs of genes that separate during gamete formation. The law of independent assortment states that different traits are inherited independently of each other. Dominant and recessive traits determine the appearance of characters in offspring. Variations arise due to genetic recombination, mutations, and environmental factors. These variations are important for evolution and survival of species.

A. MULTIPLE CHOICE QUESTIONS:

1. The phenotypic ratio in a monohybrid cross is

A) 1:2:1 B) 3:1 C) 9:3:3:1 D) 1:1

2. The law of segregation is based on

A) Independent assortment of genes B) Separation of alleles during gamete formation
C) Linkage of genes D) Crossing over

3. A heterozygous individual produces how many types of gametes?

A) One B) Two C) Three D) Four

4. Incomplete dominance was first observed in

A) Pea plant B) Snapdragon C) Four o'clock plant D) Tomato

5. The chromosomal theory of inheritance was proposed by
A) Mendel B) Sutton and Boveri C) Morgan D) Watson and Crick

6. The phenomenon where one gene masks the effect of another gene is called
A) Pleiotropy B) Epistasis C) Polygenic inheritance D) Linkage

7. ABO blood group inheritance is an example of
A) Polygenic inheritance B) Complete dominance
C) Codominance D) Incomplete dominance

8. The genotype of blood group AB is
A) IAIA B) IBIB C) IAIB D) ii

9. Crossing over occurs during
A) Prophase I B) Metaphase I C) Anaphase I D) Telophase I

10. The unit of inheritance is
A) Chromosome B) Gene C) Allele D) DNA

11. Linkage was first reported in
A)*Pisum sativum* B)*Drosophila melanogaster* C) *Zea mays* D) *Homo sapiens*

12. The genetic disorder caused due to trisomy of chromosome 21 is
A) Turner syndrome B) Klinefelter syndrome C) Down syndrome D) Patau syndrome

13. Sex determination in humans is based on
A) ZW type B) XO type C) XY type D) Haplodiploid type

14. Which disorder is caused by a recessive gene located on X-chromosome?
A) Thalassemia B) Haemophilia C) Down syndrome D)Sickle cell anaemia

15. Multiple genes controlling a single trait is called
A) Codominance B) Pleiotropy C) Polygenic inheritance D) Epistasis

16. The ratio obtained in a test cross of a dihybrid is
A) 9:3:3:1 B) 1:2:1 C) 1:1 D) 1:1:1:1

17. Sickle cell anaemia is caused by substitution of
A) Valine by glutamic acid B) Glutamic acid by valine
C) Alanine by glycine D) Glycine by alanine

18. Which enzyme is responsible for DNA replication?
A) RNA polymerase B) DNA ligase
C) DNA polymerase D) Restriction enzyme

19. Gene interaction altering the classical Mendelian ratio is called
A) Mutation B) Recombination
C) Non-Mendelian inheritance D) Chromosomal aberration

20. Phenylketonuria is an example of

A) Chromosomal disorder B) Sex-linked disorder
C) Mendelian disorder D) Polygenic disorder

B .FILL IN THE BLANKS:

21. The physical location of a gene on chromosome is called _____.
22. Mendel used _____ plant for his experiments.
23. Exchange of genetic material occurs during _____.
24. The condition in which an individual has only one X-chromosome is _____.
25. Alleles controlling the same character are found on _____ chromosomes.

C. STATE WHETHER TRUE / FALSE:

26. Crossing over increases genetic variation.
27. Linked genes always show independent assortment.
28. Polygenic traits show continuous variation.
29. Males are homogametic in humans.
30. Codominance results in blending of traits.

D. TWO-MARK QUESTIONS

31. State any two differences between genotype and phenotype.
32. Write two features of incomplete dominance.
33. Mention two causes of genetic variation.
34. State two reasons why Mendel selected pea plant for his experiments.
35. Write two differences between linkage and crossing over.

E. FIVE-MARK QUESTIONS

36. Explain Mendel's law of independent assortment with a suitable cross.
37. Describe chromosomal theory of inheritance and its significance.
38. Explain inheritance of ABO blood groups in humans with a chart.
39. Describe sex determination in humans and explain why males are heterogametic.
40. Explain the following: a. sickle cell anaemia. b. Colour blindness.

ANSWER KEY:

A. MULTIPLE CHOICE QUESTIONS:

1 B | 2 B | 3 B | 4 B | 5 B | 6 B | 7 C | 8 C | 9 A | 10 B | 11 B | 12 C | 13 C | 14 B | 15 C | 16 D | 17 B | 18 C | 19 C | 20 C

B .FILL IN THE BLANKS:

21 Locus | 22 Pea | 23 Crossing over | 24 Turner syndrome | 25 Homologous

C. STATE WHETHER TRUE / FALSE:

26 True | 27 False | 28 True | 29 False | 30 False

CHAPTER: 5- MOLECULAR BASIS OF INHERITANCE

The chapter Molecular Basis of Inheritance explains how genetic information is stored, expressed, and transmitted at the molecular level. DNA is the hereditary material that carries information in the form of genes arranged in a specific sequence of nucleotides. The structure of DNA is a double helix, as proposed by Watson and Crick, with complementary base pairing. DNA replication ensures that genetic information is accurately copied during cell division. Transcription is the process by which genetic information is copied from DNA to RNA. Translation involves the synthesis of proteins using the information carried by mRNA. Mutations and genetic code regulate variation and control the expression of traits.

A. MULTIPLE CHOICE QUESTIONS:

1. The nitrogenous base absent in RNA is

A) Adenine B) Guanine C) Thymine D) Uracil

2. The phosphodiester bond is formed between

A)Two nitrogen bases B)Sugar and base
C)Two sugars D) Sugar of one nucleotide and phosphate of another

3. The direction of DNA synthesis is always

A) 3′ → 5′ B) 5′ → 3′ C) Bidirectional without polarity D) Random

4. Which enzyme removes RNA primers during DNA replication in prokaryotes?

A) DNA polymerase I B) DNA polymerase III C) Primase D) Ligase

5. The Okazaki fragments are joined by

A) DNA polymerase III B) Helicase C) Ligase D) Gyrase

6. Which type of RNA carries amino acids during protein synthesis?

A) mRNA B) rRNA C) tRNA D) snRNA

7. The start codon for translation is

A) UAA B) UAG C) AUG D) UGA

8. Which scientist proposed the double helical model of DNA?

A) Griffith B) Meselson and Stahl
C) Watson and Crick D) Hershey and Chase

9. The experiment proving semiconservative replication of DNA was done using

A) ^{12}C B) ^{14}C C) ^{15}N D) ^{32}P

10. RNA polymerase binds to which region of DNA?

A) Operator B) Promoter C) Terminator D) Enhancer

11. Which RNA polymerase transcribes rRNA in eukaryotes?

A) RNA polymerase I B) RNA polymerase II
C) RNA polymerase III D) DNA polymerase

12. The genetic code is said to be degenerate because

A) One codon codes many amino acids
B) One amino acid is coded by multiple codons
C) Codons overlap
D) Codons lack punctuation

13. Which mutation does not change the amino acid sequence?

A) Missense B) Nonsense C) Silent D) Frameshift

14. The lac operon is an example of

A) Positive regulation
B) Negative regulation
C) Constitutive expression
D) Structural gene cluster only

15. The inducer molecule in lac operon is

A) Lactose B) Galactose C) Allolactose D) Glucose

16. The bonding between complementary bases in DNA is

A) Ionic B) Covalent C) Hydrogen D) Peptide

17. Anticodon is present on

A) mRNA B) rRNA C) tRNA D) DNA

18. The length of one turn of DNA helix is approximately

A) 2.0 nm B) 3.4 nm C) 34 nm D) 0.34 nm

19. Which enzyme unwinds DNA during replication?

A) Ligase B) Primase C) Helicase D) Topoisomerase

20. The termination of transcription in prokaryotes occurs due to

A) Sigma factor B) Rho factor C) RNA polymerase II D) DNA ligase

B .FILL IN THE BLANKS:

21. DNA is a polymer of _____.
22. The enzyme that synthesizes RNA from DNA template is _____.
23. The sequence of three nucleotides coding for one amino acid is called _____.
24. The sugar present in RNA is _____.
25. Removal of introns and joining of exons is called _____.

C. STATE WHETHER TRUE / FALSE:

26. DNA polymerase requires a primer to initiate synthesis.
27. The genetic code is overlapping in nature.
28. rRNA forms the structural and functional core of ribosome.
29. Translation occurs in the nucleus in eukaryotes.
30. One gene can code for more than one protein.

D. THREE-MARK QUESTIONS

31. Explain why DNA is considered a better genetic material uthan RNA.
32. Describe the process of translation.
33. State any three salient features of the genetic code.

34. Explain the role of tRNA in translation.
35. Differentiate between euchromatin and heterochromatin (any three points).

E. FIVE-MARK QUESTIONS

36. Describe the Meselson and Stahl experiment and its significance.
37. Explain the process of DNA replication in prokaryotes.
38. Describe transcription in eukaryotes including post-transcriptional modifications.
39. Explain translation in detail with initiation, elongation and termination.
40. Describe regulation of gene expression

ANSWER KEY:

A. MULTIPLE CHOICE QUESTIONS:

1 C | 2 D | 3 B | 4 A | 5 C | 6 C | 7 C | 8 C | 9 C | 10 B | 11 A | 12 B | 13 C | 14 B | 15 C | 16 C | 17 C | 18 B | 19 C | 20 B

B .FILL IN THE BLANKS:

21 Nucleotides | 22 RNA polymerase | 23 Codon | 24 Ribose | 25 Splicing

C. STATE WHETHER TRUE / FALSE:

26 True | 27 False | 28 True | 29 False | 30 True

CHAPTER: 6- THE EVOLUTION

The chapter Evolution explains the gradual change in organisms over generations, leading to the diversity of life on Earth. Evolution occurs through variations that arise due to genetic mutations and recombination. Charles Darwin proposed the theory of natural selection, stating that organisms with favorable traits survive and reproduce. Fossil records provide evidence of evolutionary changes and the existence of transitional forms. Homologous and analogous organs help in understanding evolutionary relationships among organisms. Speciation occurs when populations of a species become reproductively isolated over time. Evolution explains the origin of new species and the adaptation of organisms to their environment.

A. MULTIPLE CHOICE QUESTIONS:

1. The theory of natural selection was proposed by

A) Lamarck B) Darwin C) Wallace D) Mendel

2. Analogous organs are a result of

A) Divergent evolution B) Convergent evolution C) Adaptive radiation D) Co-evolution

3. Genetic drift is significant in

A) Large populations B) Small populations C) Both large and small D) None

4. The wings of birds and bats are an example of

A) Homologous organs B) Analogous organs C) Vestigial organs D) Atavistic organs

5. The primordial soup theory was proposed by

A) Miller B) Oparin and Haldane C) Darwin D) Pasteur

6. Adaptive radiation leads to
A) Formation of new species in different habitats
B) Similar traits in unrelated species
C) Reduction in genetic variation
D) Extinction

7. The molecular clock concept is based on
A) DNA mutation rates
B) Fossil dating
C) Natural selection
D) Migration patterns

8. Transitional fossils like Archaeopteryx show
A) Amphibians to reptiles
B) Reptiles to birds
C) Mammals to birds
D) Fish to amphibians

9. Founder effect is an example of
A) Genetic drift
B) Mutation
C) Natural selection
D) Gene flow

10. In Hardy-Weinberg equilibrium, the frequency of alleles remains constant if
A) Mutation occurs
B) No selection pressure exists
C) Migration occurs
D) Genetic drift is active

11. Convergent evolution occurs due to
A) Common ancestry
B) Similar environmental pressures
C) Random mutations only
D) Sexual selection

12. Gene duplication is important for
A) Protein synthesis
B) Evolution of new genes
C) DNA repair
D) Transcription

13. Darwin's finches are an example of
A) Convergent evolution
B) Adaptive radiation
C) Genetic drift
D) Stabilizing selection

14. Punctuated equilibrium theory was proposed by
A) Darwin
B) Lamarck
C) Gould and Eldredge
D) Wallace

15. Hardy-Weinberg principle helps in
A) Studying speciation
B) Studying evolution in populations
C) Fossil analysis
D) Determining mutation types

16. Which organ is considered vestigial in humans?
A) Heart
B) Appendix
C) Liver
D) Lungs

17**. Industrial melanism in peppered moth is an example of**
A) Genetic drift
B) Natural selection
C) Gene flow
D) Mutation

18. Atavism refers to
A) Development of new organs
B) Reappearance of ancestral traits
C) Loss of function
D) Extinction

19. Allopatric speciation occurs due to

A) Geographical isolation B) Temporal isolation
C) Behavioral isolation D) Hybrid inviability

20. The earliest known fossil of life belongs to

A) Prokaryotes B) Eukaryotes C) Amphibians D) Archaea

B.FILL IN THE BLANKS

21. The theory that acquired characters are inherited was proposed by _____.
22. Fossils are preserved remains of organisms found in _____.
23. Darwin's theory of natural selection is also called _____.
24. _____ is the process by which unrelated species evolve similar features.
25. Molecular phylogeny uses _____ to study evolutionary relationships.

C. TRUE / FALSE

26. Convergent evolution indicates common ancestry.
27. Mutations are the ultimate source of genetic variation.
28. Adaptive radiation produces species adapted to different ecological niches.
29. Evolution can occur without genetic changes.
30. Industrial melanism is an example of human-induced evolution.

D. TWO-MARK QUESTIONS

31. State two differences between homologous and analogous organs.
32. Mention two evidences supporting the theory of evolution.
33. Define genetic drift and give one example.
34. Write two main points of Darwin's theory of natural selection.
35. State two differences between allopatric and sympatric speciation.

E. THREE-MARK QUESTIONS

36. Explain the concept of Hardy Weinberg equilibrium with an example.
37. Describe adaptive radiation with reference to Darwin's finches.
38. Explain the significance of vestigial organs in humans.
39. Describe the process and significance of industrial melanism.
40. Explain the role of molecular phylogeny in studying evolution.

ANSWER KEY:

A. MULTIPLE CHOICE QUESTIONS:

1 B | 2 B | 3 B | 4 B | 5 B | 6 A | 7 A | 8 B | 9 A | 10 B | 11 B | 12 B | 13 B | 14 C | 15 B | 16 B | 17 B | 18 B | 19 A | 20 A

B .FILL IN THE BLANKS:

21 Lamarck | 22 Sedimentary rocks | 23 Survival of the fittest | 24 Convergent evolution | 25 DNA sequences

C. STATE WHETHER TRUE / FALSE:

26 False | 27 True | 28 True | 29

CHAPTER: 7 - HUMAN HEALTH AND DISEASES

The chapter Human Health and Diseases explains the factors that affect health and the ways to prevent illnesses. Health is a state of physical, mental, and social well-being, not just the absence of disease. Diseases can be caused by pathogens like bacteria, viruses, fungi, and parasites, or by lifestyle and genetic factors. Infectious diseases spread from person to person, while non-infectious diseases are caused by factors like poor diet or genetic disorders. The body defends itself through immunity, which can be natural or acquired through vaccines. Maintaining hygiene, balanced nutrition, regular exercise, and timely medical care are essential for good health. Awareness, prevention, and proper treatment help reduce the impact of diseases and promote a healthy life.

A. MULTIPLE CHOICE QUESTIONS:

1. Which of the following is an autoimmune disease?

A) Rheumatoid arthritis B) Tuberculosis C) Malaria D) Dengue

2. HIV primarily infects

A) Red blood cells B) Helper T lymphocytes C) B lymphocytes D) Platelets

3. The causative agent of tetanus produces

A) Endotoxin B) Exotoxin C) Mycotoxin D) Neurohormone

4. Which vitamin deficiency causes scurvy?

A) Vitamin A B) Vitamin B12 C) Vitamin C D) Vitamin D

5. Malaria parasite completes sexual reproduction in

A) Human liver B) Human RBC C) Anopheles mosquito D) Tsetse fly

6.Which disease is caused by Trypanosoma?

A) Malaria B) Sleeping sickness C) Filariasis D) Kala-azar

7. Antibiotics are effective against

A) Viruses B) Bacteria C) Protozoa D) Fungi

8. Which is a vector-borne viral disease?

A) Dengue B) Tuberculosis C) Leprosy D) Tetanus

9. The BCG vaccine protects against

A) Smallpox B) Polio C) Tuberculosis D) Hepatitis B

10. Which pathogen causes ringworm in humans?

A) Virus B) Bacteria C) Fungus D) Protozoa

11. Elephantiasis is caused by

A) Plasmodium B) *Wuchereria bancrofti* C) Trypanosoma D) Mycobacterium

12. Which part of the immune system is responsible for antibody production?

A) Macrophages B) T lymphocytes C) B lymphocytes D) NK cells

13. Which disease is characterized by demyelination of neurons?
A) Alzheimer's B) Multiple sclerosis C) Parkinson's D) Epilepsy

14.Hepatitis B virus is transmitted primarily through
A) Air B) Water C) Blood and body fluids D) Food

15. Antibiotic resistance occurs due to
A) Genetic mutation in pathogen B) Host immunity C) Environmental factors only D) Vaccination

16. The term "zoonosis" refers to
A)Disease transmitted from humans to humans B)Disease transmitted from animals to humans
C)Disease transmitted through water D)Disease transmitted by insects only

17. Which is a non-communicable disease?
A) Influenza B) Diabetes mellitus C) Tuberculosis D) Measles

18. Histoplasmosis is caused by
A) Virus B) Fungus C) Bacteria D) Protozoa

19. The causative agent of cholera produces
A) Exotoxin B) Endotoxin C) Mycotoxin D) Neurotoxin

20.Which of the following is used in passive immunization?
A) Antigen B) Vaccine C) Preformed antibodies D) Toxoid

B .FILL IN THE BLANKS:
21.The causative agent of leprosy is _____.
22. Influenza virus is an example of _____ pathogen.
23. Vitamin B1 deficiency leads to _____.
24. The first line of defense in the human body includes _____.
25. Dengue virus is transmitted by _____ mosquito.

C. STATE WHETHER TRUE / FALSE:
26. Tetanus is a communicable disease.
27. HIV infection is curable with antibiotics.
28. Immunity acquired from mother to baby through breast milk is passive immunity.
29. Filariasis is caused by a virus.
30. Active immunization involves stimulation of host immune system.

D.TWO-MARK QUESTIONS
31. State two differences between bacterial and viral diseases.
32. Name two vector-borne diseases and their vectors.
33. Write two preventive measures for water-borne diseases.
34. Write a short note on AIDS.
35. Write difference between B- cells and T - cells.

E.THREE-MARK QUESTIONS

36.Explain the mechanism of HIV infection in human T-cells.
37.Describe the life cycle of Plasmodium in humans and mosquitoes.
38.Explain active and passive immunization with examples.
39.Describe the cause, symptoms, and preventive measures of tuberculosis.
40.Explain humeral and cell mediated immune response.

ANSWER KEY:

A. MULTIPLE CHOICE QUESTIONS:

1 A | 2 B | 3 B | 4 C | 5 C | 6 B | 7 B | 8 A | 9 C | 10 C | 11 B | 12 C | 13 B | 14 C | 15 A | 16 B | 17 B | 18 B | 19 A | 20 C

B .FILL IN THE BLANKS:

21 Mycobacterium leprae | 22 Viral | 23 Beriberi | 24 Skin and mucous membranes | 25 Aedes

C. STATE WHETHER TRUE / FALSE:

26 False | 27 False | 28 True | 29 False | 30 True

CHAPTER: 8- MICROBES IN HUMAN WELFARE

The chapter Microbes in Human Welfare explains the beneficial and harmful roles of microorganisms in our daily life. Some microbes are used in the production of food products like yogurt, cheese, and alcohol through fermentation. Certain bacteria and fungi help in the production of antibiotics, vitamins, and enzymes for medical and industrial use. Microbes play an important role in agriculture by fixing nitrogen, decomposing organic matter, and controlling pests. Some microorganisms are used in bioremediation to clean up oil spills and degrade pollutants. However, harmful microbes can cause diseases in humans, animals, and plants. Overall, microbes have a significant impact on health, industry, agriculture, and environmental management.

A. MULTIPLE CHOICE QUESTIONS:

1. Which microbe is used for commercial production of citric acid?

A) *Aspergillus niger* B) *Lactobacillus* C) *Penicillium notatum* D) *Saccharomyces cerevisiae*

2. The first antibiotic discovered was

A) Streptomycin B) Penicillin C) Tetracycline D) Erythromycin

3. Single Cell Protein (SCP) is rich in

A) Carbohydrates B) Lipids C) Proteins D) Vitamins only

4. Which bacterium is used in the production of yoghurt?

A) *Streptococcus lactis* B) *Lactobacillus bulgaricus*
C) *Escherichia coli* D) *Clostridium*

5. Activated sludge consists mainly of

A) Fungal spores
B) Flocs of bacteria and fungi
C) Viruses and protozoa
D) Algal cells

6. Which microbe is used for ethanol production in industries?

A) Aspergillus
B) Lactobacillus
C) Saccharomyces
D) Rhizobium

7. Biogas mainly contains

A)Carbon dioxide
B)Methane
C)Hydrogen sulphide
D)Nitrogen

8. Which bacterium converts milk into curd by producing lactic acid?

A)*Bacillus subtilis*
B)*Lactobacillus*
C)*Rhizobium*
D)*Nitrosomonas*

9. Statins are used for

A)Lowering blood cholesterol
B)Treating bacterial infections
C)Enhancing immunity
D)Producing vaccines

10. Which fungus produces penicillin?

A)*Penicillium notatum*
B)*Aspergillus flavus*
C)*Rhizopus*
D)*Candida*

11. The primary treatment of sewage involves

A) Biological oxidation
B) Anaerobic digestion
C) Physical removal of solids
D)Methanogenesis

12. Which microorganism is used in biocontrol of plant diseases?

A) *Bacillus thuringiensis*
B) T*richoderma*
C) *Azotobacter*
D) *Methanobacterium*

13. Methanogens are commonly found in

A) Activated sludge
B) Root nodules
C) Rumen of cattle
D) Soil surface

14. Which product is formed during secondary sewage treatment?

A) Sludge
B) Effluent
C) Methane gas
D) Flocs

15. Which microorganism improves soil fertility by nitrogen fixation?

A) Lactobacillus
B) Azotobacter
C) Yeast
D) Penicillium

16. Which microbe is used to control butterfly caterpillars?

A) *Trichoderma*
B) *Bacillus thuringiensis*
C) *Azospirillum*
D) *Methanobacterium*

17. Which enzyme is produced by microbes and used in detergents?

A) Amylase
B) Protease
C) Lipase
D) All of these

18. The sludge obtained from sewage treatment can be used as

A) Pesticide
B) Fertiliser
C) Antibiotic
D) Biofuel

19. Which microbe is used for production of acetic acid?

A) *Acetobacter aceti*
B) *Lactobacillus*
C) *Rhizobium*
D) *Clostridium*

20. The role of microbes in organic farming is mainly

A) Pest multiplication
B) Soil nutrient enrichment
C) Weed growth
D) Disease spread

B.FILL IN THE BLANKS:

21. _____ bacteria are responsible for methane production in biogas plants.
22. The antibiotic penicillin was discovered by _____.
23. Conversion of milk into curd lowers the _____ content.
24. The biological treatment of sewage is also called _____ treatment.
25. _____ is a biofertiliser that fixes nitrogen in free-living condition.

C. STATE WHETHER TRUE / FALSE:

26.Yeast is used in bread making due to CO_2 production.
27.Bacillus thuringiensis is harmful to all insects.
28.Activated sludge is rich in aerobic microbes.
29.Methanogens require oxygen for growth.
30.Antibiotics are effective against viral infections.

D. TWO-MARK QUESTIONS

31.State two advantages of Single Cell Protein as human food.
32.Mention two roles of microbes in sewage treatment.
33. Write two differences between biofertilisers and chemical fertilisers.
34. Give two uses of microbes in industrial products.
35. State two reasons why biogas is considered a good fuel.

ANSWER KEY:

A. MULTIPLE CHOICE QUESTIONS:

1 A | 2 B | 3 C | 4 B | 5 B | 6 C | 7 B | 8 B | 9 A | 10 A / 11 C | 12 B | 13 C | 14 D | 15 B | 16 B | 17 D | 18 B | 19 A | 20 B

B .FILL IN THE BLANKS:

21 Methanogenic | 22 Alexander Fleming | 23 Lactose | 24 Secondary | 25 Azotobacter

C. STATE WHETHER TRUE / FALSE:

26 True | 27 False | 28 True | 29 False | 30 False

CHAPTER:9- BIOTECHNOLOGY – PRINCIPLES AND PROCESSES

The chapter Biotechnology: Principles and Processes explains the use of biological organisms and systems to develop useful products and technologies. It involves techniques like genetic engineering, tissue culture, and recombinant DNA technology. In recombinant DNA technology, genes from one organism can be inserted into another to produce desired traits or products. Microorganisms are widely used in biotechnology for producing medicines, vaccines, enzymes, and biofuels. Techniques like fermentation, cloning, and bioreactors help in large-scale production of valuable substances. Biotechnology also plays a role in agriculture by developing disease-resistant and high-yielding crops. Careful application of biotechnology can improve health, industry, and the environment while addressing ethical and safety concerns.

A. MULTIPLE CHOICE QUESTIONS:

1. Restriction enzymes belong to the class of

A) Ligases B) Endonucleases C) Exonucleases D) Polymerases

2. The recognition site of restriction enzymes is usually

A) Asymmetrical B) Palindromic
C) Random D) Single stranded

3. Which enzyme is used to join DNA fragments?

A) DNA polymerase B) RNA polymerase
C) DNA ligase D) Reverse transcriptase

4. The plasmid used as a cloning vector must have

A) High molecular weight B) Origin of replication
C) Linear DNA D) Protein coat

5. Which bacterium is commonly used as host in recombinant DNA technology?

A) *Agrobacterium tumefaciens* B) *Bacillus subtilis*
C) *Escherichia coli* D) *Streptococcus*

6. Sticky ends are formed by

A) Exonucleases B) DNA ligase
C) Restriction endonucleases D) Topoisomerase

7. The enzyme reverse transcriptase synthesizes

A) RNA from DNA B) DNA from RNA
C) Protein from RNA D) DNA from protein

8. PCR was developed by

A) Watson B) Crick
C) Kary Mullis D) Paul Berg

9. The thermostable DNA polymerase used in PCR is obtained from

A) *E. coli* B) *Thermus aquaticus*
C) *Bacillus* D) *Agrobacterium*

10. Which step of PCR involves separation of DNA strands?

A) Annealing
B) Extension
C) Denaturation
D) Ligation

11. Bioreactors are designed to

A) Store enzymes
B) Produce vaccines only
C) Provide optimal conditions for growth
D) Preserve microbes

12. Which selectable marker is used in pBR322?

A) Ampicillin resistance
B) Kanamycin resistance
C) Tetracycline resistance
D) Both A and C

13. Gene cloning refers to

A) Formation of new genes
B) Expression of genes
C) Making identical copies of DNA
D) Gene mutation

14. Which vector is used to introduce genes into plants?

A) Plasmid
B) Virus
C) *Agrobacterium tumefaciens*
D) Bacteriophage

15. The role of ori in plasmid is

A) Selection of transformants
B) Regulation of transcription
C) Initiation of replication
D) Restriction of enzymes

16. Downstream processing involves

A) Gene insertion
B) Product recovery and purification
C) DNA amplification
D) Host selection

17. Which technique separates DNA fragments based on size?

A) Centrifugation
B) Chromatography
C) Gel electrophoresis
D) Spectrophotometry

18. Which enzyme adds phosphate group at 5′ end of DNA?

A) DNA ligase
B) Alkaline phosphatase
C) Polynucleotide kinase
D) DNA polymerase

19. Recombinant DNA is formed by

A) Natural mutation
B) Transcription
C) Joining DNA from different sources
D) Translation

20. Which factor is essential for efficient transformation of bacteria?

A) High temperature
B) Calcium ions
C) Oxygen
D) Antibiotics

B .FILL IN THE BLANKS:

21. The enzyme used to cut DNA at specific sites is called _____.
22. The process of introducing recombinant DNA into host cell is called _____.
23. PCR amplification requires repeated cycles of _____, annealing and extension.
24. _____ is used as a reporter gene in many cloning experiments.
25. The large-scale production of biotechnological products is done in _____.

C. STATE WHETHER TRUE / FALSE:

26.Restriction enzymes cut DNA randomly.
27. PCR can amplify DNA without using living cells.
28. Plasmids are extrachromosomal DNA elements.
29. Bioreactors maintain sterile conditions.
30. Downstream processing occurs before gene cloning.

D. TWO-MARK QUESTIONS

31. State two properties of an ideal cloning vector.
32. Mention two roles of restriction endonucleases in biotechnology.
33. Write two difference between sticky and blunt ends.
34. State two functions of selectable marker genes.
35. Give two advantages of PCR technique.

E. THREE-MARK QUESTIONS

36. Explain the steps involved in polymerase chain reaction.
37. Describe the structure and function of a stirred-tank bioreactor.
38. Explain the role of *Agrobacterium tumefaciens* in plant genetic engineering.
39. Describe the principle of gel electrophoresis.
40. Explain the importance of downstream.

ANSWER KEY:

A. MULTIPLE CHOICE QUESTIONS:

1 B | 2 B | 3 C | 4 B | 5 C | 6 C | 7 B | 8 C | 9 B | 10 C | 11 C | 12 D | 13 C | 14 C | 15 C | 16 B | 17 C | 18 C | 19 C | 20 B

B .FILL IN THE BLANKS:

21 Restriction endonuclease | 22 Transformation | 23 Denaturation | 24 lacZ | 25 Bioreactor

C. STATE WHETHER TRUE / FALSE:

26 False | 27 True | 28 True | 29 True | 30 False

CHAPTER:10- BIOTECHNOLOGY AND ITS APPLICATIONS

The chapter Biotechnology and Its Applications explains how biological systems and organisms are used to solve real-world problems and produce useful products. In medicine, biotechnology is used to develop vaccines, antibiotics, insulin, and other therapeutic products. In agriculture, it helps in creating genetically modified crops that are high-yielding, pest-resistant, and nutritious. Industrial biotechnology uses microbes and enzymes for producing biofuels, alcohol, and biodegradable plastics. Environmental applications include bioremediation, where microbes are used to clean oil spills and degrade pollutants. Biotechnology also plays a role in food production through fermentation and preservation techniques. Overall, biotechnology improves health, agriculture, industry, and environmental management, making life more sustainable and efficient.

A. MULTIPLE CHOICE QUESTIONS:

1. The first recombinant DNA therapeutic protein approved for human use was

A) Interferon
B) Insulin
C) Growth hormone
D) Erythropoietin

2. Insulin produced using recombinant DNA technology is called

A) Humulin
B) Proinsulin
C) Preproinsulin
D) Isophane insulin

3. Gene therapy was first successfully used to treat

A) Cystic fibrosis
B) ADA deficiency
C) Haemophilia
D) Sickle cell anaemia

4. Bt cotton is resistant to

A) Aphids
B) Bollworm
C) Whitefly
D) Thrips

5. Cry proteins are produced by

A) *Bacillus anthracis*
B) *Bacillus thuringiensis*
C) Agrobacterium tumefaciens
D) *Pseudomonas*

6. RNA interference (RNAi) results in

A) Overexpression of gene
B) Silencing of specific mRNA
C) DNA mutation
D) Protein synthesis

7. Golden rice is genetically modified to be rich in

A) Vitamin B12
B) Iron
C) Vitamin A
D) Vitamin C

8. The vector used for gene transfer in plants is commonly

A) Retrovirus
B) Plasmid Ti
C) Bacteriophage
D) Cosmids

9. Transgenic animals are those that

A) Are cloned
B) Contain foreign gene
C) Are hybrids
D) Show mutation

10. Which enzyme is used to synthesize cDNA?

A) DNA polymerase
B) RNA polymerase
C) Reverse transcriptase
D) Ligase

11. GM crops help in reducing

A) Irrigation requirement
B) Fertiliser usage
C) Post-harvest loss
D) All of these

12.ELISA technique is based on

A) Antigen–antibody interaction
B) DNA hybridisation
C) Protein electrophoresis
D) Cell culture

13. Recombinant vaccines are safer because they

A) Use live pathogens
B) Do not contain pathogen
C) Are cheaper only
D) Are oral vaccines

14. Which transgenic animal is used to produce human alpha-1 antitrypsin?

A) Sheep
B) Cow
C) Mouse
D) Goat

15. Ethical concerns related to GM organisms mainly involve

A) High cost
B) Environmental impact
C) Difficulty in cultivation
D) Low yield

16. Which disease is targeted by RNAi-based transgenic plants?

A) Viral infection
B) Fungal infection
C). Bacterial infection
D) Nutrient deficiency

17. The purpose of molecular diagnosis is

A) Disease prevention
B) Early detection of disease
C) Treatment of disease
D) Vaccination

18. Pharming refers to

A) Crop improvement
B) Animal breeding
C) Production of pharmaceuticals using transgenic organisms
D) Organic farming

19. The insulin gene introduced in bacteria is of

A) Rat
B) Pig
C) Human
D) Sheep

20. The major advantage of Bt crops is

A) Increased water requirement
B) Reduced pesticide use
C) Higher fertiliser need
D) Soil depletion

B .FILL IN THE BLANKS:

21.The gene responsible for insulin production is located on chromosome _____.
22. Bt toxin is activated in the _____ gut of insects.
23.The technique used to detect pathogens using antibodies is _____.
24.Transgenic plants expressing dsRNA show _____ of target genes.
25. Golden rice was developed to combat _____ deficiency.

C. STATE WHETHER TRUE / FALSE:

26.Recombinant insulin contains an extra C-peptide.
27.Bt toxin is produced in inactive form in bacteria.
28.Gene therapy involves replacement of defective gene.
29.GM crops always increase biodiversity.
30.ELISA can be used for HIV detection.

D. TWO-MARK QUESTIONS

31. State two advantages of recombinant insulin over animal insulin.
32. Mention two roles of transgenic plants in biotechnology.
33. Give two reasons why Bt crops are environment-friendly.
34. State two applications of ELISA in medical science.
35. Write a short note on gene therapy.

E.THREE-MARK QUESTIONS

36. Explain the production of recombinant human insulin.
37. Describe RNA interference mechanism in eukaryotes.
38. Explain the role of Bt toxin in pest resistance.
39. Describe the applications of transgenic animals in medicine.
40. Explain molecular diagnosis using PCR and ELISA.

ANSWER KEY:

A. MULTIPLE CHOICE QUESTIONS:

1 B | 2 A | 3 B | 4 B | 5 B | 6 B | 7 C | 8 B | 9 B | 10 C | 11 D | 12 A | 13 B | 14 D | 15 B | 16 A | 17 B | 18 C | 19 C | 20 B

B .FILL IN THE BLANKS:

21 11 | 22 Alkaline | 23 ELISA | 24 Silencing | 25 Vitamin A

C. STATE WHETHER TRUE / FALSE:

26 False | 27 True | 28 True | 29 False | 30 True

CHAPTER:11- ORGANISMS AND POPULATIONS

The chapter Organisms and Populations explains how living beings interact with each other and their environment. An organism is an individual living entity, while a population is a group of organisms of the same species living in a particular area. Populations are characterized by their size, density, distribution, age structure, and growth patterns. Interactions within populations and with the environment affect survival, reproduction, and resource availability. Factors like birth rate, death rate, immigration, and emigration influence population dynamics. Populations can show different growth patterns, such as exponential or logistic growth, depending on environmental conditions. Understanding populations helps in conservation, resource management, and studying ecological relationships.

A. MULTIPLE CHOICE QUESTIONS:

1. The ability of an organism to survive and reproduce in its habitat is called

A) Adaptation B) Fitness C) Niche D) Population density

2. Which factor regulates population size in a density-dependent manner?

A) Flood B) Earthquake C) Competition D) Fire

3. The curve obtained in exponential population growth is

A) J-shaped B) S-shaped C) Bell-shaped D) Linear

4. Carrying capacity of an environment is represented by

A) r B) K C) N D) t

5. The logistic growth equation was proposed by

A) Darwin B) Verhulst-Pearl C) Malthus D) Lotka

6. Which of the following shows clumped distribution?

A) Desert plants B) Birds nesting on trees
C) Fishes in open ocean D) Grass in a lawn

7. The interaction where both species are harmed is

A) Mutualism B) Parasitism C) Competition D) Commensalism

8. Which interaction is (+, 0)?

A) Mutualism B) Amensalism C) Commensalism D) Predation

9. Lichens represent an example of

A) Parasitism B) Mutualism C) Competition D) Amensalism

10. The death rate in a population refers to

A) Number of deaths per unit time
B) Number of individuals dying per unit area
C) Proportion of individuals dying per unit time
D) Total deaths in a population

11. Ectothermic animals regulate body temperature mainly by
A) Metabolic heat B) Behavioural means C) Sweating D) Shivering

12. Which adaptation helps desert plants reduce water loss?
A) Broad leaves B) Thick cuticle
C) High transpiration D) Shallow roots

13. The type of population pyramid with broad base indicates
A) Declining population B) Stable population
C) Expanding population D) Extinct population

14. Predators help maintain ecological balance by
A) Eliminating producers B) Reducing competition
C) Controlling prey population D) Increasing disease

15. Which organism shows hibernation?
A) Camel B) Frog C) Crow D) Fish

16. The relationship between fig plant and wasp is
A) Commensalism B) Mutualism
C) Parasitism D) Competition

17. Population density is usually measured as
A) Biomass only B) Number per unit area/volume
C) Birth rate D) Death rate

18. Which interaction benefits one species and harms the other?
A) Mutualism B) Commensalism
C) Parasitism D) Neutralism

19. In logistic growth, maximum growth rate occurs at
A) N = 0 B) N = K
C) N = K/2 D) N > K

20. Migration affects population density by
A) Births only B) Deaths only
C) Immigration and emigration D) Competition

B .FILL IN THE BLANKS:
21. The environment factor that affects organisms irrespective of population size is _____ factor.
22. The term for inactive state during unfavorable summer is _____.
23. The intrinsic rate of natural increase is denoted by _____.
24. The relationship where one species is unaffected is called _____.
25. The maximum population size an environment can sustain is called _____.

C. STATE WHETHER TRUE / FALSE:

26. All populations show exponential growth indefinitely.
27. Mutualism is essential for survival of both interacting species.
28. Population density can be measured by indirect methods.
29. Poikilotherms maintain constant body temperature.
30. Competition occurs only between different species.

D. THREE-MARK QUESTIONS

31. Explain any three population attributes used to study population dynamics.
32. Difference between commensalism and ammensalism
33. Explain predator–prey interaction with ecological significance.
34. Describe the logistic growth model and its importance.
35. Explain three ways by which organisms cope with environmental stress.

ANSWER KEY:

A. MULTIPLE CHOICE QUESTIONS:

1 B | 2 C | 3 A | 4 B | 5 B | 6 B | 7 C | 8 C | 9 B | 10 C | 11 B | 12 B | 13 C | 14 C | 15 B | 16 B | 17 B | 18 C | 19 C | 20 C

B .FILL IN THE BLANKS:

21 Density	independent | 22 Aestivation | 23 r | 24 Commensalism | 25 Carrying capacity

C. STATE WHETHER TRUE / FALSE:

26 False | 27 True | 28 True | 29 False | 30 False

CHAPTER:12- THE ECOSYSTEM

The chapter The Ecosystem explains the interactions between living organisms and their physical environment. An ecosystem consists of biotic components (plants, animals, microbes) and abiotic components (soil, water, air, temperature). Energy flows through an ecosystem in the form of food chains and food webs, starting from producers to consumers and decomposers. Nutrients are recycled in ecosystems through processes like the carbon and nitrogen cycles. Different ecosystems, such as forests, grasslands, deserts, and aquatic systems, have distinct communities and environmental conditions. Human activities, such as deforestation, pollution, and urbanization, can disrupt ecosystems and affect biodiversity. Maintaining ecosystem balance is essential for the survival of organisms and the sustainability of the environment.

A. MULTIPLE CHOICE QUESTIONS:

1. The standing crop in an ecosystem refers to

A) Rate of biomass production
B) Available nutrients
C) Amount of living biomass at a given time
D) Net primary productivity

2. Which ecosystem has the highest primary productivity?

A) Desert
B) Grassland
C) Tropical rainforest
D) Tundra

3. The 10% law of energy transfer was proposed by
A) Lindeman B) Elton C) Odum D) Hutchinson

4. Energy flow in an ecosystem is
A) Cyclic B) Bidirectional C) Unidirectional D) Multidirectional

5. Which of the following is a detritivore?
A) Hawk B) Earthworm C) Deer D) Snake

6. In an aquatic ecosystem, the major producers are
A) Zooplankton B) Macrophytes C) Phytoplankton D) Benthos

7. Which trophic level has maximum energy?
A) Primary consumers B) Secondary consumers
C) Tertiary consumers D) Producers

8. The pyramid of energy is always
A) Inverted B) Spindle-shaped C) Upright D) Irregular

9. Which biogeochemical cycle does not involve a gaseous phase?
A) Carbon cycle B) Nitrogen cycle
C) Phosphorus cycle D) Oxygen cycle

10. Net primary productivity is equal to
A) GPP + Respiration B) GPP − Respiration
C) Respiration – GPP D) Secondary productivity

11. Which ecosystem service is provided by wetlands?
A) Pollination B) Flood control
C) Seed dispersal D) Soil formation

12. The ecological efficiency between trophic levels is approximately
A) 1% B) 5% C) 10% D) 20%

13. Decomposers mainly act on
A) Producers B) Consumers C) Detritus D) Inorganic nutrients

14. Which component of ecosystem is responsible for mineral cycling?
A) Producers B) Consumers C) Decomposers D) Herbivores

15. The rate of formation of organic matter by producers is called
A) Standing crop B) Gross primary productivity
C) Net productivity D) Secondary productivity

16. In a forest ecosystem, the pyramid of biomass is

A) Upright B) Inverted
C) Spindle-shaped D) Linear

17. Which process releases carbon dioxide into atmosphere?

A) Photosynthesis B) Decomposition
C) Nitrogen fixation D) Ammonification

18. Ecological pyramids are graphical representations of

A) Food chains B) Food webs
C) Trophic levels D) Energy cycles

19. Which organism converts inorganic nutrients into organic forms?

A) Decomposers B) Herbivores
C) Carnivores D) Producers

20. The detritus food chain begins with

A) Green plants B) Herbivores
C) Dead organic matter D) Carnivores

B .FILL IN THE BLANKS:

21. The total amount of solar energy trapped by producers is called _____.
22. The transfer of energy from one trophic level to another is called _____.
23. _____ cycle is also known as sedimentary cycle.
24. Breakdown of complex organic matter into simpler substances is called _____.
25. The main source of energy for all ecosystems is _____.

C. STATE WHETHER TRUE / FALSE:

26. Energy decreases as it flows through successive trophic levels.
27. The phosphorus cycle includes a gaseous phase.
28. Decomposers release nutrients back to the ecosystem.
29. The pyramid of numbers is always upright.
30. Ecosystem stability depends on energy flow and nutrient cycling.

D. TWO-MARK QUESTIONS:

31. Define gross primary productivity and net primary productivity.
32. Mention two differences between grazing food chain and detritus food chain.
33. State two ecological services provided by ecosystems.
34. Explain why energy pyramids are always upright.
35. Mention the role of decomposers in decomposition.

E. FIVE MARK QUESTIONS (COMPREHENSION)

Passage 1: Energy Flow in Ecosystem

Energy enters an ecosystem through producers in the form of solar radiation. Only a small fraction of this energy is converted into chemical energy during photosynthesis. As energy moves through successive trophic levels, a significant amount is lost as heat due to metabolic activities. This results in

a gradual decrease in available energy at higher trophic levels, thereby limiting the length of food chains.

Questions:

1. Identify the primary source of energy in an ecosystem.
2. Why is only a small fraction of solar energy converted into biomass?
3. State the law governing energy transfer between trophic levels.
4. Why are food chains usually short in length?

Passage 2: Productivity in Ecosystems

Primary productivity refers to the rate at which producers synthesise organic matter. Gross primary productivity (GPP) is the total organic matter produced, while net primary productivity (NPP) is the portion available to consumers after respiratory losses. Different ecosystems show variations in productivity depending on climatic conditions and availability of nutrients.

Questions:

1. Differentiate between GPP and NPP.
2. Why is NPP important for heterotrophs?
3. Name one ecosystem with high primary productivity.
4. Mention one factor affecting primary productivity.

Passage 3: Decomposition Process

Decomposition is the breakdown of complex organic matter into simpler inorganic substances. It involves processes such as fragmentation, leaching, catabolism, humification, and mineralisation. The rate of decomposition depends on climatic factors and the chemical composition of detritus. Warm and moist conditions accelerate decomposition.

Questions:

1. What is decomposition?
2. Name any two processes involved in decomposition.
3. Which environmental conditions favour rapid decomposition?
4. What is the role of decomposers in nutrient cycling?

Passage 4: Ecological Pyramids

Ecological pyramids represent the trophic structure of an ecosystem and can be pyramids of number, biomass, or energy. While pyramids of number and biomass may be inverted in some ecosystems, the pyramid of energy is always upright due to the unidirectional flow of energy.

Questions:

1. Name the three types of ecological pyramids.
2. Why can pyramids of biomass be inverted in aquatic ecosystems?
3. Why is the pyramid of energy always upright?
4. What do ecological pyramids indicate about trophic levels?

Passage 5. The nutrient cycling

Nutrient cycling involves the movement of elements like carbon, nitrogen, and phosphorus through biotic and abiotic components of the ecosystem. While some cycles have a gaseous phase, others are sedimentary in nature. These cycles ensure the continuous availability of essential nutrients for organisms.

Questions:

1. What is nutrient cycling?
2. Name one gaseous and one sedimentary biogeochemical cycle.
3. Why is nutrient cycling important for ecosystem stability?
4. Which group of organisms plays a key role in nutrient recycling?

ANSWER KEY:

A. MULTIPLE CHOICE QUESTIONS:

1 C | 2 C | 3 A | 4 C | 5 B | 6 C | 7 D | 8 C | 9 C | 10 B | 11 B | 12 C | 13 C | 14 C | 15 B | 16 A | 17 B | 18 C | 19 D | 20 C

B .FILL IN THE BLANKS:

21 Gross primary productivity | 22 Energy flow | 23 Phosphorus | 24 Decomposition | 25 Sun

C. STATE WHETHER TRUE / FALSE:

26 True | 27 False | 28 True | 29 False | 30 True

CHAPTER:13- BIODIVERSITY AND ITS CONSERVATION

The chapter Biodiversity and Its Conservation explains the variety of life forms on Earth, including plants, animals, and microorganisms. Biodiversity exists at three levels: genetic, species, and ecosystem diversity, all of which are important for ecological balance. It provides essential resources like food, medicine, and raw materials, and maintains the stability of ecosystems. Human activities such as deforestation, pollution, and overexploitation threaten biodiversity and lead to species extinction. Conservation strategies include protecting natural habitats, establishing wildlife sanctuaries, and implementing laws to prevent exploitation. Ex-situ conservation methods like botanical gardens, seed banks, and zoos help preserve endangered species outside their natural habitats. Protecting biodiversity is crucial for sustaining life, ecosystem services, and the overall health of the planet.

A. MULTIPLE CHOICE QUESTIONS:

1. The term biodiversity was popularised by

A) Charles Darwin B) Edward Wilson C) Linnaeus D) Mendel

2. The number of species present in a region is referred to as

A) Species diversity B) Species richness C) Genetic diversity D) Ecosystem diversity

3. The species-area relationship was proposed by

A) Darwin B) Humboldt C) Elton D) Wallace

4. According to the species–area relationship, species richness increases with

A) Latitude B) Area C) Altitude D) Temperature

5. The exponent value (z) for large areas like continents is

A) 0.1–0.2 B) 0.6–1.2 C) 1.5–2.0 D) 0.01–0.02

6. Which biome shows maximum biodiversity?
A) Tundra B) Desert C) Tropical rainforest D) Temperate forest

7. Endemism refers to
A) Wide distribution of species
B) Species confined to a particular region
C) Species extinction
D) Species migration

8. Which of the following is a biodiversity hotspot in India?
A) Thar Desert B) Western Ghats
C) Gangetic Plains D) Deccan Plateau

9. Which category of IUCN indicates highest risk of extinction?
A) Vulnerable B) Endangered
C) Critically endangered D) Rare

10. The accelerated loss of species due to human activities is called
A) Speciation B) Co-extinction
C) Mass extinction D) Adaptive radiation

11. Loss of one species leading to loss of another dependent species is termed
A) Speciation B) Co-extinction
C) Endemism D) Succession

12. Which factor is a major cause of biodiversity loss?
A) Habitat fragmentation B) Over-exploitation
C) Alien species invasion D) All of these

13. Ex situ conservation includes
A) National parks B) Wildlife sanctuaries
C) Zoological parks D) Biosphere reserves

14. Sacred groves are conserved due to
A) Legal protection B) Religious beliefs
C) Government rules D) Scientific value

15. The Earth Summit was held in
A) Stockholm B) Kyoto
C) Rio de Janeiro D) Paris

16. The Convention on Biological Diversity came into force in
A) 1987
B) 1992
C) 1995
D) 2000

17. Which of the following is an invasive alien species in India?
A) Teak
B) Eucalyptus
C) Sal
D) Neem

18. Biodiversity provides ecosystem services such as
A) Pollination
B) Climate regulation
C) Nutrient cycling
D) All of these

19. The in situ method of conservation preserves
A) Only animals
B) Only plants
C) Whole ecosystem
D) Germplasm

20. Which of the following best represents genetic diversity?
A) Species variety
B) Variety of ecosystems
C) Allelic variation within species
D) Community diversity

B .FILL IN THE BLANKS:
21. The total number of species present in the world is estimated to be about _____ million.
22. The mathematical relationship between species richness and area is expressed as _____.
23. Regions with high endemism and high threat are called _____.
24. Conservation of biodiversity in natural habitat is called _____ conservation.
25. The most severe threat to biodiversity is _____ destruction.

C. STATE WHETHER TRUE / FALSE:
26.Tropical regions have greater biodiversity than temperate regions.
27. Co-extinction is a natural process without human influence.
28. India is one of the twelve mega-diversity countries.
29. Botanical gardens are examples of in situ conservation.
30. Biodiversity has both economic and ecological importance.

D. TWO-MARK QUESTIONS
31. Define biodiversity and mention its three levels.
32. State two reasons for higher biodiversity in tropics.
33. Mention two advantages of in-situ conservation.
34. Write two consequences of loss of biodiversity.
35. Mention two objectives of biodiversity conservation.

E. FIVE-MARK QUESTIONS
36. Explain the major causes of biodiversity loss.
37. Describe in situ and ex situ conservation methods with examples.
38. Explain the significance of biodiversity hotspots.
39. Describe the importance of biodiversity in maintaining ecosystem stability.
40. Explain the species–area relationship with suitable examples.

ANSWER KEY:

A. MULTIPLE CHOICE QUESTIONS:

1 B | 2 B | 3 B | 4 B | 5 B | 6 C | 7 B | 8 B | 9 C | 10 C | 11 B | 12 D | 13 C | 14 B | 15 C | 16 B | 17 B | 18 D | 19 C | 20 C

B .FILL IN THE BLANKS:

21 7 | 22 S = CA^Z | 23 Hotspots | 24 In situ | 25 Habitat

C. STATE WHETHER TRUE / FALSE:

26 True | 27 False | 28 True | 29 False | 30 True