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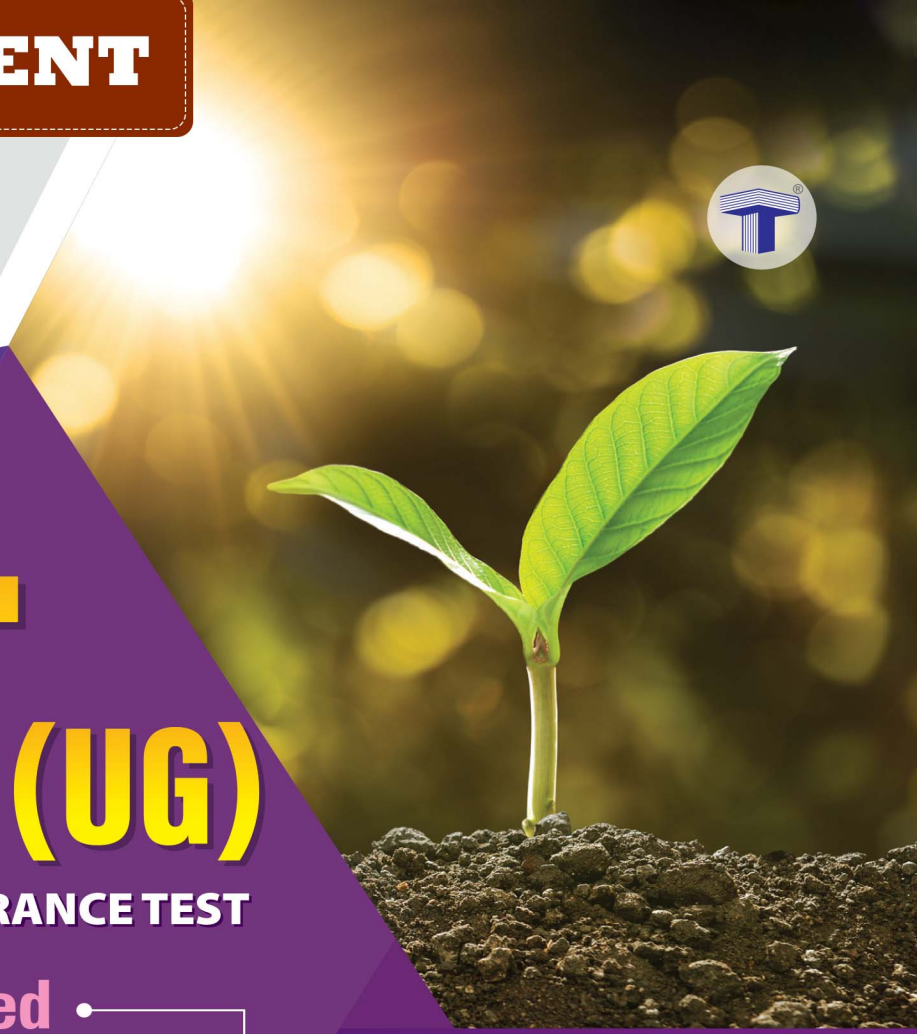

CUET (UG)

COMMON UNIVERSITY ENTRANCE TEST

Based on notified syllabus prescribed by NTA

1878 MCQs

LOADED WITH AMAZING FEATURES

- Concept Videos
- Caution
- Topic Test
- Subtopic wise MCQs
- Smart Key/ Thinking Hatke

BIOLOGY

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Target Publications® Pvt. Ltd.

For Common University Entrance Test CUET (UG) based on syllabus prescribed by National Testing Agency (NTA)

CUET (UG)

Biology

Salient Features

- **'1878'** MCQs for ample practice
- Synopsis to offer a crisp overview of the chapter
- Subtopic wise segregation of MCQs for efficient practice
- Cautions designed to impart holistic learning
- Inclusion of Smart keys/Thinking Hatke to promote lateral thinking and problem-solving ability
- Video/PDF links provided via Q.R codes for boosting conceptual retention.
- Topic Test provided for self-assessment at the end of each chapter
- Solution to Topic Test accessible via Q.R. code
- Includes Passage-based MCQs with Answers (Solution provided through Q.R. code)
- Includes relevant questions of CUCET 2021
- Includes Question Paper of CUET (UG) 2022 18th August (Slot - 2) (Solution provided through Q.R. Code)

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PREFACE

Common University Entrance Test, CUET (UG) is a pivotal juncture in a student's academic journey. It is a single-window opportunity for the Students to seek admission in the premier higher education institutions.

Target Publications, with more than a decade of experience and expertise in the domain of competitive examination, offers **"CUET (UG) Biology"** for all the CUET (UG) aspirants. This book is compiled according to the notified syllabus prescribed by NTA for CUET (UG).

It is a complete preparation and practice book with the unmatched comprehensive amalgamation of theory, MCQs, and the tools that will be needed to clear the exam successfully.

The content of this book is arranged in a logical sequence to enable strategic learning. It provides the students with scientifically accurate context, several study techniques, and relevant supporting details essential for a better understanding of the concepts of Biology.

The chapter begins with **Synopsis**, and is followed by '**Multiple Choice Questions'** (MCQs). The questions in the MCQs section are specially created and compiled to help students revise concepts as well as to give them practice of questions which require understanding of multiple-concepts. To aid students, detailed solutions are provided for difficult questions.

While ensuring the complete coverage of the syllabus in an effortless and easy to grasp format, emphasis is also given to optimize students learning outcomes. Keeping the following key objectives in mind:
Time management, easy memorization, revision, and non-conventional yet simple methods for MCQ solving, we have infused several features such as, **Caution, Connetions, Smart Key and Thinking hatke**.

Topic Test is provided at the end of each chapter for self evaluation. Solution to Topic Test can be viewed by scanning the QR code provided at the end of each chapter.

A section of **Passage-based MCQs** covering a wide range of concepts is included at the end of the book. These passages are segregated chapter-wise and their solutions can be viewed through Q.R. code in a pdf format.

Question paper of CUET (UG) 2022–18th August (Slot - 2) is provided to offer students a glimpse of the complexity of questions asked in entrance examination, solution to which is provided through Q.R. code. The paper has been split topic wise to let the students know which of the topics were more relevant in the latest examination.

We are confident that this book will cater to the needs of students across varied backgrounds and effectively assist them to achieve their goals.

We hope the book benefits the learner as we have envisioned.

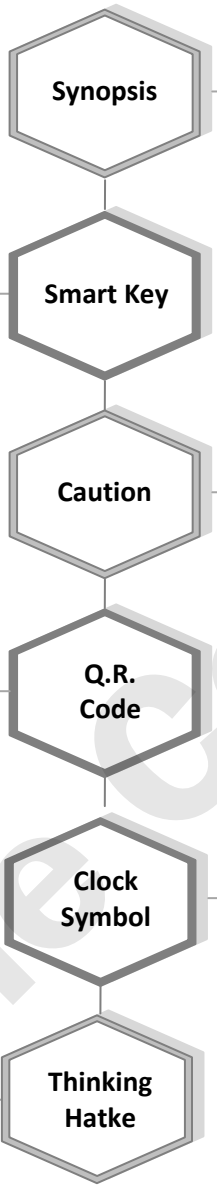
Publisher

Edition: Second

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.

Please write to us on: mail@targetpublications.org

KEY FEATURES



'**Synopsis**' presents crisp summary of a chapter in efficient form of pointers, tables, charts.

'**Smart Key**' can be used to memorise or revise the key points at a glance.

'**Caution**' helps students to clarify the difference between two related words or homophones.

'**QR code**' provides:

i. Access to a video/PDF in order to boost understanding of a concept or activity
ii. Solution to Topic Test of each chapter.
iii. Solutions to Passage-based MCQs.
iv. Solution to CUET (UG) 2022 18th August (Slot - 2) Question paper

'**Clock Symbol**' instructs students that the given MCQ can be solved apace by applying either smart keys or thinking hatke.

'**Thinking Hatke**' section provides the students with tricks to arrive at the correct answer in a more non-conventional yet simple way.

CONTENTS

Note: Symbol along with the question indicates there exists either an unconventional way or use of either Smart Key/ Thinking hatke for solving that MCQ.

'**Caution**' helps students to clarify the difference between two related words or homophones.

CUET (UG) Exam Pattern

Subject combinations for each paper, type of questions in each paper, and mode of examination are given in the table below:

Mode of Examination: Computer Based Test (CBT) mode		
Sections	**Subjects/ Tests**	**Questions to be Attempted**
Section 1A - Languages	There are 13 different languages. Any of these languages may be chosen.	40 questions to be attempted out of 50 in each language.
Section 1B - Languages	There are 20 Languages. Any of these languages may be chosen.	
Section 2 - Domain	There are 27 Domains specific subjects being offered under this section. A candidate may choose any subject as desired by the applicable University/ Universities.	35/40 Questions to be attempted out of 45/50.
Section 3 - General Test	For any such undergraduate programme / programmes being offered by Universities where a General Test is being used for admission.	50 Questions to be attempted out of 60
Note: 1. *From the above subjects / languages, the candidate can choose maximum of 10 subjects from all three Sections.* 2. *Examination will be conducted on multiple days in three shifts, depending on the number of Candidates and Subject choices.*		

Candidates are advised to visit the NTA CUET (UG) official website ***https://cuet.samarth.ac.in/*** *for latest updates regarding the Examination.*

How This Book Covers the Entire Syllabus of CUET (UG) Biology

CUET (UG) Syllabus	Subtopic no.	Subtopic name
UNIT I – REPRODUCTION		
Chapter 1 : Reproduction in organisms		
Reproduction, a characteristic feature of all organisms for continuation of species; Modes of reproduction – Asexual and sexual; Asexual reproduction; Modes- Binary fission, sporulation, budding, gemmule, fragmentation; vegetative propagation in plants.	1.1,1.2	Asexual Reproduction, Sexual Reproduction
Chapter 2 : Sexual reproduction in flowering plants		
Flower structure	2.1	Flower – A Fascinating Organ of Angiosperms
Development of male and female gametophytes; Pollination–types, agencies and examples; Outbreeding devices; Pollen-Pistil interaction	2.2	Pre-Fertilization: Structures and Events
Double fertilization	2.3	Double Fertilization
Post fertilization events– Development of endosperm and embryo, Development of seed and formation of fruit.	2.4	Post fertilization: Structures and Events
Special modes– apomixis, parthenocarpy, polyembryony; Significance of seed and fruit formation.	2.5	Apomixis and Polyembryony
Chapter 3 : Human Reproduction		
Male and female reproductive systems; Microscopic anatomy of testis and ovary	3.1,3.2	The Male Reproductive System, The Female Reproductive System
Gametogenesis- spermatogenesis & oogenesis	3.3	Gametogenesis
Menstrual cycle	3.4	Menstrual Cycle
Fertilization	3.5	Fertilization and Implantation
Embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementary idea); Parturition (Elementary idea); Lactation (Elementary idea).	3.6,3.7	Pregnancy and Embryonic Development, Parturition and Lactation
Chapter 4 : Reproductive health		
Need for reproductive health and prevention of sexually transmitted diseases (STD)	4.1,4.4	Reproductive Health – Problems and Strategies, Sexually Transmitted Diseases (STDs)
Birth control- Need and Methods, Contraception	4.2	Population Explosion and Birth Control
Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies – IVF, ZIFT, GIFT (Elementary idea for general awareness).	4.3,4.5	Medical Termination of Pregnancy (MTP), Infertility
UNIT II – GENETICS AND EVOLUTION		
Chapter 5 : Heredity and variation		
Mendelian Inheritance	5.1	Mendel's Laws of Inheritance
Deviations from Mendelism– Incomplete dominance, Co-dominance, Multiple alleles and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes	5.2,5.3	Inheritance of One Gene, Inheritance of Two Genes
Sex determination– In humans, birds, honey bee	5.4	Sex Determination
Linkage and crossing over	5.3	Inheritance of Two Genes
Sex linked inheritance- Haemophilia, Colour blindness; Mendelian disorders in humans– Thalassemia; Chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.	5.5	Genetic Disorders

CUET (UG) Syllabus	Subtopic no.	Subtopic name
Chapter 6 : Molecular Basis of Inheritance		
Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging	6.1,6.2	The DNA, The Search for Genetic Material
DNA replication	6.4	Replication
Central dogma	6.1	The DNA
Transcription	6.5	Transcription
Genetic code	6.6	Genetic Code
Translation	6.7	Translation
Gene expression and regulation– Lac Operon	6.8	Regulation of Gene Expression
Genome and human genome project	6.9	Human Genome Project
DNA finger printing	6.10	DNA Fingerprinting
Chapter 7 : Evolution		
Origin of life	7.1	Origin of Life
Biological evolution and evidences for biological evolution (Paleontological, comparative anatomy, embryology and molecular evidence); Darwin's contribution	7.2,7.3	Evolution of Life forms – A Theory, What are the Evidences of Evolution?
Modern Synthetic theory of Evolution	7.5	Biological Evolution
Mechanism of evolution– Variation (Mutation and Recombination)	7.6	Mechanism of Evolution
Natural Selection with examples	7.5	Biological Evolution
Types of natural selection; Gene flow and genetic drift; Hardy- Weinberg's principle	7.7	Hardy-Weinberg's Principle
Adaptive Radiation	7.4	What is Adaptive Radiation?
Human evolution	7.9	Origin and Evolution of Man
UNIT III – BIOLOGY AND HUMAN WELFARE		
Chapter 8 : Human Health and Disease		
Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis, Typhoid, Pneumonia, common cold, amoebiasis, ring worm)	8.1	Common Diseases in Humans
Basic concepts of immunology–vaccines	8.2	Immunity
Cancer	8.4	Cancer
HIV and AIDS	8.3	AIDS
Adolescence, drug and alcohol abuse	8.5	Drugs and Alcohol Abuse
Chapter 9 : Strategies for Enhancement in Food Production		
Plant breeding	9.2	Plant Breeding
Tissue culture	9.4	Tissue Culture
Single cell protein	9.3	Single Cell Protein (SCP)
Biofortification	9.2	Plant Breeding
Apiculture and Animal husbandry	9.1	Animal Husbandry
Chapter 10 : Microbes in human welfare		
Microbes in household food processing	10.1	Microbes in Household Products
Microbes in industrial production	10.2	Microbes in Industrial Products
Microbes in sewage treatment	10.3	Microbes in Sewage Treatment
Microbes in energy generation	10.4	Microbes in Production of Biogas
Microbes as biocontrol agents	10.5	Microbes as Biocontrol Agents
Microbes as biofertilizers	10.6	Microbes as Biofertilisers
UNIT IV – BIOTECHNOLOGY AND ITS APPLICATIONS		
Chapter 11 : Biotechnology : Principles and Processes		
Genetic engineering (Recombinant DNA technology).	11.1,11.2,11.3	Principles of Biotechnology, Tools of Recombinant DNA Technology, Processes of Recombinant DNA Technology

CUET (UG) Syllabus	Subtopic no.	Subtopic name
Chapter 12 : Biotechnology and It's Applications		
Application of Biotechnology in health and agriculture	12.1,12.2	Biotechnological Applications in Agriculture, Biotechnological Applications in Medicine
Human insulin and vaccine production, gene therapy	12.2	Biotechnological Applications in Medicine
Genetically modified organisms- Bt crops; Transgenic Animals	12.1,12.3	Biotechnological Applications in Agriculture, Transgenic Animals
Biosafety issues– Biopiracy and patents.	12.4	Ethical Issues
UNIT V – ECOLOGY AND ENVIRONMENT		
Chapter 13 : Organisms and Populations		
Habitat and niche; Population and ecological adaptations	13.1	Organisms and its Environment
Population interactions–mutualism, competition, predation, parasitism; Population attributes–growth, birth rate and death rate, age distribution.	13.2	Populations
Chapter 14 : Ecosystem		
Ecosystems: Patterns, components	14.1	Ecosystem – Structure and Function
Productivity	14.2	Productivity
Decomposition	14.3	Decomposition
Energy flow	14.4	Energy Flow
Pyramids of number, biomass, energy	14.5	Ecological Pyramids
Nutrient cycling (carbon and phosphorous)	14.6	Ecological Succession
Ecological succession	14.7	Nutrient Cycling
Ecological Services– Carbon fixation, pollination, oxygen release	14.8	Ecosystem Services
Chapter 15 : Biodiversity and its Conservation		
Concept of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity	15.1	Biodiversity
Biodiversity conservation; Hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, National parks and sanctuaries	15.2	Biodiversity Conservation
Chapter 16 : Environmental issues		
Air pollution and its control	16.1	Air pollution and its control
Water pollution and its control	16.2	Water pollution and its control
Agrochemicals and their effects	16.4	Agrochemicals and their effects
Solid waste management	16.3	Solid waste
Radioactive waste management	16.5	Radioactive waste
Greenhouse effect and global warming	16.6	Greenhouse effect and global warming
Ozone depletion	16.7	Ozone Depletion in the Stratosphere
Deforestation; Any three case studies as success stories addressing environmental issues.	16.9	Deforestation

Note: This book covers a few subtopics in addition to the syllabus prescribed by NTA to help students have thorough and complete understanding of the concepts.

01 Reproduction in Organisms

Content and Concepts

Synopsis

➢ **Reproduction:** The ability of living organisms to give rise to the young ones of its own kind.

Types of Reproduction
- Asexual → Offspring produced by a single parent with/without gamete formation.
- Sexual → Offspring produced by two parents (of opposite sex) and fusion of male and female gamete is involved.

Connections

'**Connection**' enables students to interlink concepts covered in different chapters.

Connections

In chapter 5 Principles of Inheritance and Variation, you will study how genetic variations are created and inherited during reproduction.

➢ **Asexual Reproduction:** Single (parent) individual is involved in producing the offspring.

Sr. No.	Method	Description	Examples
1.	**Binary fission**	Parental cell divides into two halves and each half grows rapidly into an adult.	*Amoeba, Paramoecium*
2.	**Fragmentation**	It involves division of parent into numerous fragments and each fragment develops into a new individual.	*Spirogyra , Hydra*, sponges, some flat worms, etc.
3.	**Budding**	Unequal division takes place. Small buds are produced which initially remain attached to the parent cell, but later get separated and mature into new organisms (cells).	*Hydra,* Yeast
4.	**Zoospore formation**	Zoospores are microscopic motile structures.	*Chlamydomonas*
5.	**Conidia**	Conidia are asexual reproductive structures.	*Penicillium*
6.	**Gemmules**	Gemmules are asexual reproductive structures.	Sponges

➢ **Vegetative Propagation in plants:** Process of reproduction seen in plants in which a portion of the plant body functions as a propagule and gives rise to a new plant.

Sr. No.	Method	Description	Examples
1.	**Eyes of potato**	Small plantlets emerge from the eyes (axillary buds) of potato tuber.	Potato
2.	**Rhizome**	Small plantlets develop from rhizome.	Ginger, turmeric, banana, etc
3.	**Bulbil**	Bulbils are modified vegetative or floral buds, propagative in function. Bulbils on maturation, get detached from the plant and fall on the ground. Under favourable condition, it develops into new plant.	*Agave*
4.	**Leaf buds**	Adventitious buds arise from the notches on the leaves. These buds are capable of giving rise to a new plant.	*Bryophyllum*
5.	**Offset**	These are one internode long runners in rosette plants at ground or water level.	Water hyacinth

➢ **Sexual Reproduction:** Production of offsprings by formation and fusion of gametes.

Phases in life cycle of organisms

- **Juvenile phase (In animals)/ vegetative phase (In plants)** → Certain stage of growth and maturity to be attained before organisms can reproduce sexually.
- **Reproductive phase** → Begins after the end of juvenile/vegetative phase. Flowering in higher plants marks the beginning of the reproductive phase.

1. Cyclic changes in ovaries ,accessory ducts and hormones during the reproductive phase of placental mammals:

i.	**Oestrus cycle**	Takes place in non-primate mammals like dogs, cows, sheeps, rats, tigers, deers, etc.
ii.	**Menstrual cycle**	Takes place in primates (monkey, ape and human beings).
iii.	**Seasonal breeders**	Many mammals, which live in wild exhibit reproductive cycles only during favourable seasons.
iv.	**Continuous breeders**	Many other mammals are reproductively active throughout their reproductive phase.

2. Events in Sexual Reproduction:

Sexual Reproduction

Pre-fertilization	Fertilization	Post-fertilization
• Gametogenesis • Gamete transfer	• External fertilization • Internal fertilization	• Zygote formation • Embryogenesis

i. Gametogenesis:

Gametogenesis
Formation of male and female gametes

Homogametes (Isogametes)	Heterogametes
Two gametes are similar in appearance. e.g., Some algae	Two gametes are of morphologically distinct types. e.g., Majority of sexually reproducing organisms.

- **Sexuality in organisms:**

Sexuality in Plants

Bisexual (Monoecious)	Unisexual (Dioecious)
• Both male and female reproductive structures are present on the same plant. • e.g. Cucurbits, Coconuts	• Male and female reproductive structures are present on different plants. • e.g. Papaya, Date palm

Sexuality in Animals

Unisexual	Bisexual (Hermaphrodite)
• Male and female sex organs are present in different individuals. • e.g. Cockroach	• Male and female sex organs are present in the same individual. • e.g. Earthworm, leech, sponge, tapeworm

ii. Gamete Transfer: In most organisms, male gamete is motile, while the female gamete is non-motile. Exceptions to this are few fungi and algae, in which both gametes are motile.

iii. Fertilization: Fertilization is the complete and permanent fusion of two haploid gametes to form a diploid zygote. It is also known as **syngamy**.

Smart Key - 1

Homothallic OR **Monoecious** plants denote **Bisexual** condition→ Male and female flowers on same plant→ E.g. Cucurbits, Coconuts

Heterothallic OR **Dioecious** plants denote **Unisexual** condition→ Male and female flowers on separate

Syngamy

External Fertilization	Internal Fertilization
• Occurs outside the body of organism • External medium is needed e.g. water • Large number of gametes are produced. • Offsprings are extremely vulnerable to predators. • e.g. Aquatic organisms like algae, bony fishes, frogs, etc.	• Occurs inside the body of organism. • Egg formed inside female body fuses with male gamete. • Number of sperms produced are greater than the number of eggs. • In seed-bearing plants, male gametes (non-motile) are carried by pollen tubes to the female gamete. • e.g. Terrestrial organisms like birds, reptiles, mammals. Plants like Bryophytes, pteridophytes, gymnosperms, angiosperms.

➢ **Parthenogenesis:** Development of an egg into a complete individual without fertilization is known as parthenogenesis. It is found in many non-vertebrates such as bees, rotifers and even some lizards and birds (turkey).

➢ **Post - fertilization Events:** These include the events which take place after zygote formation in sexual reproduction.

Post - fertilization Events

Zygote formation	Embryogenesis
• After fertilization a diploid zygote is formed. Zygote (2n) $\xrightarrow{\text{Meiosis}}$ Spores (n) $\xrightarrow{\text{develop}}$ Haploid Individuals (n)	• It is the process of development of embryo from zygote. • During embryogenesis, zygote undergoes cell division (mitosis) and cell differentiation.

➢ **Oviparous and viviparous animals:**

	Oviparous Animals	Viviparous Animals
i.	Development of zygote takes place outside the female's body.	Development of zygote takes place inside the female's body.
ii.	They lay eggs which are covered by hard calcareous shell.	Zygote develops into young one.
iii.	They lay eggs in a safe place in the environment, but chances of survival of young one is less.	They give birth directly to young ones and their chances of survival are more due to proper embryonic care and protection.
iv.	e.g. Birds, reptiles	e.g. Majority of mammals including humans.

➢ **Post- fertilization changes in flowering plants:**

Before fertilization	After fertilization
Sepals, petals, stamens	Wither and fall off
Zygote	Embryo
Ovules	Seeds
Ovary	Fruit
Ovary wall	Pericarp

Multiple Choice Questions

1.1 Asexual Reproduction

1. The period from birth to the natural death of an organism is called as
   (A) regeneration (B) life span
   (C) metamorphosis (D) reproduction

2. _____ is a life process that is not essential for an individual's survival but for survival of the species.
   (A) Growth (B) Reproduction
   (C) Respiration (D) Nutrition

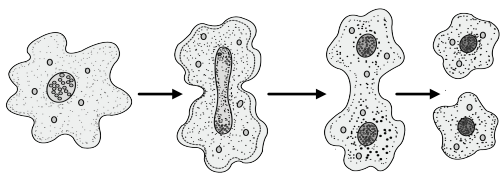
3. Which of the following statements regarding asexual reproduction are correct?
   i. It is uniparental.
   ii. The offsprings produced are genetically identical to the parent.
   iii. Production and fusion of gametes is necessary.
   iv. The offsprings produced show genetic variation.
   (A) i and ii are correct
   (B) iii and iv are correct
   (C) ii and iii are correct
   (D) i and iv are correct

4. Asexual reproduction involves
   (A) only meiosis
   (B) only mitosis
   (C) both mitosis and meiosis
   (D) either mitosis or meiosis

5. A clone is a group of individuals obtained through
   (A) self-pollination
   (B) hybridization
   (C) vegetative propagation
   (D) cross pollination

6. Methods of asexual reproduction in lower organisms include
   (A) binary fission and budding
   (B) fertilization and syngamy
   (C) porogamy and autogamy
   (D) geitonogamy and xenogamy

7. Identify the mode of asexual reproduction shown in the diagram given below.



   (A) Fragmentation
   (B) Binary fission
   (C) Budding
   (D) Gemmule formation

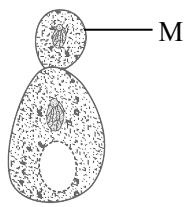
8. Gemmule formation in sponges are useful in
   (A) asexual reproduction
   (B) sexual reproduction
   (C) parthenogenesis
   (D) parthenocarpy

9. The phenomenon in which *Amoeba* forms a cyst around itself during unfavourable condition is called as
   (A) sporulation (B) encystation
   (C) guttation (D) heterocyst

10. *Amoeba* is immortal because
    (A) it is multicellular
    (B) it is microscopic
    (C) it reproduces by sexual method only
    (D) parental body is distributed among the offsprings during binary fission

11. Which of the following statements is INCORRECT about process of sporulation in *Amoeba*?
    (A) During unfavourable condition, *Amoeba* forms a three layered hard covering (cyst) around itself.
    (B) The encyst *Amoeba* divides by multiple fission to produce pseudopodiospores.
    (C) The cyst wall of *Amoeba* burst to release spores which grow up into many *Amoeba*.
    (D) Sporulation occurs when favourable conditions return.

12. Identify the asexual reproductive structure 'M' in the following diagram.



    (A) Zoospore (B) Bud
    (C) Gemmule (D) Conidium

13. Complete the given analogy.
    Budding : Yeast :: _____: *Chlamydomonas*
    (A) Binary fission (B) Conidia
    (C) Zoospores (D) Gemmules

14. Motile zoospores are produced by
    (A) *Chlamydomonas* (B) *Penicillium*
    (C) Bacteria (D) *Amoeba*

15. *Penicillium* produce non-motile spores called
    (A) zoospores (B) conidia
    (C) fragments (D) buds

16. Asexual reproduction through formation of gemmule occurs in
    (A) Ascidian (B) *Hydra*
    (C) Planaria (D) *Spongilla*

17. Fragmentation is a mode of asexual reproduction seen in
    (A) *Penicillium* (B) *Amoeba*
    (C) *Hydra* (D) *Paramecium*

18. Identify the INCORRECT statement.
(A) In asexual reproduction, the offspring produced are morphologically and genetically identical to the parent.
(B) Zoospores are sexual reproductive structures.
(C) In asexual reproduction, a single parent produces offspring with or without the formation of gametes.
(D) Conidia are asexual structures in *Penicillium.*

19. Considering mode of asexual reproduction, match the Column I with II and select the correct option.

	Column I		Column II
i.	Yeast	a.	Fragmentation
ii.	*Penicillium*	b.	Zoospores
iii.	Filamentous algae	c.	Budding
iv.	*Chlamydomonas*	d.	Conidia

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

20. The most significant value of vegetative propagation is that,
(A) it is a means of producing a large population of individuals genetically identical to the parent
(B) it produces new variety
(C) it is an ancient practice
(D) it enables rapid production of genetic variation

21. A process of multiplication in which a portion of fragment of plant body functions as propagule and develops into new individual is called
(A) vegetative propagation
(B) sexual propagation
(C) gametogenesis
(D) parthenocarpy

22. Identify the ODD one out.
(A) Offset (B) Bulbil
(C) Rhizome (D) Conidia

23. Which one of the following is NOT true about vegetative propagation?
(A) Easy and cheaper method
(B) Rapid propagation
(C) Asexual process is involved
(D) Production of genetically dissimilar plants

24. Read the following statements about 'Terror of Bengal' and select the correct ones.
i. 'Terror of Bengal' is the name given to water hyacinth (*Eichhornia*), an algae.
ii. *Eichhornia* was introduced in India due to its aesthetic value.
iii. *Eichhornia* drains oxygen from the water which leads to death of fishes.
(A) i and ii (B) i and iii
(C) ii and iii (D) i, ii and iii

25. In ginger vegetative propagation occurs through
(A) rhizome (B) offsets
(C) bulbils (D) runners

26. The 'eyes' of potato are located at the _____
(A) root apex (B) leaf apex
(C) nodes (D) internodes

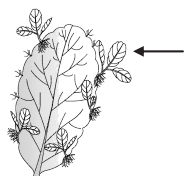
27. Appearance of vegetative propagules from the nodes of plants such as sugarcane and ginger is mainly because
(A) nodes are shorter than internodes
(B) nodes have meristematic cells
(C) nodes are located near the soil
(D) nodes have non-photosynthetic cells.

28. In *Bryophyllum,* vegetative reproduction takes place with the help of
(A) adventitious bud
(B) fibrous roots
(C) floral bud
(D) adventitious roots

29. One of the plants using 'Foliar adventitious buds' as method for vegetative propagation is
(A) Banana (B) Ginger
(C) *Bryophyllum* (D) *Colocasia*

30. Which of the following is propagated by a bulbil?
(A) *Agave* (B) *Bryophyllum*
(C) Onion (D) *Bougainvillea*

31. Which vegetative propagule is shown by the arrow marked in the diagram given below?
(A) Adventitious buds
(B) Offset
(C) Bulbil
(D) Rhizome



32. Offsets are produced by
(A) meiotic divisions (B) mitotic divisions
(C) parthenocarpy (D) parthenogenesis

33. Match the Column I (Plant) and Column II (Vegetative Propagule) and choose the correct option.

	Column I (Plant)		Column II (Vegetative Propagule)
i.	Banana	a.	Leaf buds
ii.	Potato	b.	Rhizome
iii.	*Bryophyllum*	c.	Offset
iv.	Water Hyacinth	d.	Eyes

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

34. Potato is multiplied vegetatively with the help of
(A) bulb
(B) rhizome
(C) eyes (buds) on tubers
(D) offset

35. In the given options, which one cannot propagate by vegetative means?
(A) A marginal piece of *Bryophyllum* leaf
(B) A middle piece of sugarcane internode
(C) A piece of potato tuber with eyes
(D) A piece of ginger rhizome

36. Which one of the following statements is NOT correct?
(A) Water Hyacinth growing in the standing water, drains oxygen from water that leads to the death of fishes.
(B) Offsprings produced by the asexual reproduction are called clones.
(C) Microscopic, motile, asexual reproductive structures are called zoospores.
(D) In potato, banana and ginger, the plantlets arise from the internodes which are present in the modified stem.

1.2 Sexual Reproduction

1. Sexual reproduction is characterized by
(A) fertilization of male and female gametes
(B) zygote formation
(C) embryogenesis
(D) all of these

2. The term 'clone' cannot be applied to offspring formed by sexual reproduction because
(A) offspring do not possess exact copies of parental DNA.
(B) DNA of only one parent is copied and passed on to the offspring.
(C) Offsprings are formed at different times.
(D) DNA of parent and offspring are completely different.

3. Before all organisms can reproduce sexually, they have to reach a stage of growth and maturity. This period of growth is called
(A) juvenile phase
(B) vegetative phase
(C) reproductive phase
(D) Both (A) and (B)

4. Which of the following flowers only once in its life-time?
(A) Mango (B) Jackfruit
(C) Bamboo species (D) Papaya

5. Which statement is INCORRECT about sexual reproduction?
(A) It is a rapid process.
(B) Offsprings show variation
(C) Meiosis takes place
(D) It is biparental process.

6. Identify from the following group of animals, which exhibit oestrus cycle.
(A) Monkey, ape, man and elephant
(B) Lion, deer, dog and cow
(C) Lion, dog, monkey and ape
(D) Cow, monkey, elephant and ape

7. Menstrual cycle is seen in
(A) Humans (B) Rats
(C) Sheep (D) All of these

8. The end of _____ phase can be considered as one of the parameters of senescence (old age).
(A) Vegetative (B) juvenile
(C) Zygotic (D) reproductive

9. Which one of the following is NOT a Pre-fertilization event?
(A) Gametogenesis (B) Gamete transfer
(C) Embryogenesis (D) Both (A) and (B)

10. The gametes which are similar in appearance making it impossible to categorise them into male and female gametes are called
(A) isogametes (B) heterogametes
(C) pistillate (D) staminate

11. In heterogametes, the male gamete is _(i)_ and the female gamete is _(ii)_.
(A) i – Pistil; ii – Antherozoid
(B) i – Antherozoid; ii –Egg
(C) i – Pistil; ii – Anther
(D) i – Ovum; ii – Antherozoid

12. In many fungi and plants, which of the following term/s is/are used to denote the unisexual condition?
(A) Monoecious (B) Homothallic
(C) Heterothallic (D) Both (A) and (B)

13. Complete the analogy.
Monoecious plant : Coconut :: Dioecious plant : _____
(A) Papaya (B) Date palm
(C) Cucurbits (D) Both (A) and (B)

14. In Papaya plant, flowers are
(A) hermaphrodite (B) unisexual
(C) monoecious (D) homothallic

15. When both types of reproductive organs are present in separate parents, such animals are called
(A) dioecious (B) monoecious
(C) hermaphrodite (D) both (B) and (C)

16. *Marchantia* is considered as a heterothallic plant because it is _____.
(A) Heterogametic (B) Bisexual
(C) Monoecious (D) Dioecious

17. Choose the correct matching.

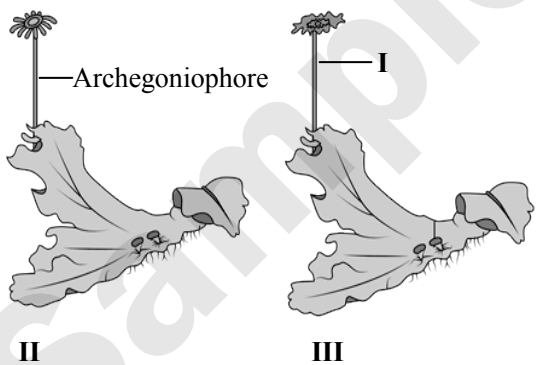
	List-I		List-II
i.	Dioecious plant with archegoniophore	a.	Papaya
ii.	Monoecious plant with Oogonium	b.	*Chara*
iii.	Homothallic plants	c.	Fungi
iv.	Dioecious plant with pistillate flowers	d.	Maize
		e.	*Marchantia*

	i.	ii.	iii.	iv.
(A)	e.	b.	d.	a.
(B)	e.	c.	b.	a.
(C)	e.	d.	c.	a.
(D)	e.	a.	b.	c.

18. Monoecious plant of *Chara* shows occurrence of
(A) antheridiophore and archegoniophore on the same plant
(B) stamen and carpel on the same plant
(C) upper antheridium and lower oogonium on the same plant
(D) upper oogonium and lower antheridium on the same plant

19. Which of the following is a unisexual animal?
(A) Cockroach (B) Earthworm
(C) Leech (D) Tapeworm

20. Identify I, II and III in the given figure of *Marchantia.*



	I	II	III
(A)	Antheridiophore	Staminode	Stamen
(B)	Female stalk	Female thallus	Male thallus
(C)	Antheridiophore	Female thallus	Male thallus
(D)	Male stalk	Male thallus	Female thallus

21. Organisms belonging to _____ have a diploid plant body.
(A) Pteridophytes (B) Gymnosperms
(C) Angiosperms (D) All of these

22. Meiosis takes place in
(A) Meiocyte (B) Conidia
(C) Gemmule (D) Megaspore

23. Process of fusion of haploid cells is called
(A) cell cycle (B) meiosis
(C) mitosis (D) syngamy

24. Which one of the following organisms shows the least chromosome number in meiocyte?
(A) Fruit fly (B) House fly
(C) Human being (D) Butterfly

25. In potato, the gamete has 24 chromosomes. What will be the chromosome number in its meiocyte?
(A) 12 (B) 48 (C) 24 (D) 36

26. In a majority of organisms,
(A) male gamete is motile and female gamete is non-motile.
(B) male gamete is non-motile and female gamete is motile.
(C) both male and female gametes are motile.
(D) both male and female gametes are non-motile.

27. In algae, pteridophytes and bryophytes, _____ serves as the medium for gamete transfer.
(A) insects (B) wind
(C) birds (D) water

28. Read the following statements and choose the correct option.
In seed plants,
i. __P__ are the carriers of male gametes.
ii. __Q__ has the egg.
iii. Pollen grains are produced in __R__.
iv. Before fertilization can happen, pollen grains have to be transferred to the __S__.

	P	Q	R	S
(A)	Antherozoid	Ovary	Anthers	Ovule
(B)	Sperms	Ovum	Anthers	Ovary
(C)	Pollen grains	Ovule	Anthers	Stigma
(D)	Anthers	Ovary	Sac	Style

29. Identify the INCORRECT statement.
(A) Self-fertilization takes place in a pea plant.
(B) Pollen tube discharge male gametes near the stigma.
(C) Pollen grains germinate on the stigma.
(D) In dioecious plants, pollination facilitates transfer of pollen grains to stigma.

30. The number of chromosomes in the shoot tip cells of a maize plant is 20. The number of chromosomes in the microspore mother cells of the same plant shall be
(A) 20 (B) 10 (C) 40 (D) 15

31. Complete and permanent fusion of two haploid gametes to form a diploid zygote is called
(A) chalazogamy (B) porogamy
(C) syngamy (D) misogamy

32. External fertilization does NOT take place in
(A) fishes (B) amphibians
(C) bryophytes (D) Both (A) and (B)

33. 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) ii and iv

34. Development of an egg into a complete individual without fertilization by a sperm is known as
(A) pollination (B) amphimixis
(C) parthenogenesis (D) syngamy

35. Parthenogenesis occurs in
(A) turkey (B) honeybees
(C) rotifers (D) all of these

36. Which of the following is a post-fertilization event in flowering plants?
(A) Transfer of pollen grains
(B) Embryo development
(C) Formation of flower
(D) Formation of pollen grains

37. Which among these is NOT a post fertilization event?
(A) Fruit formation (B) Gametogenesis
(C) Seed formation (D) Embryogenesis

38. In organisms having haplontic life cycle, zygote divides by (i) to form (ii) spores that grow into (iii) individuals.
(A) i – meiosis; ii – haploid; iii – haploid
(B) i – mitosis; ii – haploid; iii – haploid
(C) i – meiosis; ii – diploid; iii – haploid
(D) i – meiosis; ii – haploid; iii – diploid

39. Every sexually reproducing organism begins life as a
(A) embryo (B) zygote
(C) spore (D) gamete

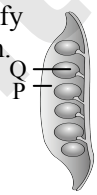
40. During embryogenesis, zygote undergoes
(A) Mitosis
(B) Cell differentiation
(C) Meiosis
(D) Both (A) and (B)

41. Which of the following are oviparous animals?
(A) Human beings (B) Mammals
(C) Reptiles (D) Both (A) and (B)

42. With reference to viviparous animals, find the CORRECT statement.
(A) Development of zygote takes place outside the female's body.
(B) They lay eggs.
(C) Fertilized eggs are covered by hard calcareous shell.
(D) They give direct birth to young ones.

43. Which of the following parts of the flower wither and fall off after fertilization?
(A) Stamens (B) Petals
(C) Pistil (D) Both (A) and (B)

44. In the diagram given below, identify P and Q and select the correct option.



(A) P – Ovule; Q – Seeds
(B) P – Pericarp; Q – Seeds
(C) P – Sepals; Q – Seeds
(D) P – Ovary; Q – Fruit

45. Select the CORRECT sequence of events.
(A) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell differentiation → Cell division (Cleavage) → Organogenesis
(B) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell division (Cleavage) → Cell differentiation → Organogenesis
(C) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell division → (Cleavage) → Organogenesis → Cell differentiation
(D) Gametogenesis → Syngamy → Gamete transfer → Zygote → Cell division (Cleavage) → Cell differentiation → Organogenesis

46. A few statements describing certain features of reproduction are given below.
i. Gametic fusion takes place.
ii. Transfer of genetic material takes place.
iii. Reduction division takes place.
iv. Progeny have some resemblance with parents.
Select the options that are true for both asexual and sexual reproduction from the options given below.
(A) i and ii (B) ii and iii
(C) ii and iv (D) i and iii

47. Offspring formed by sexual reproduction exhibit more variation than those formed by asexual reproduction because
(A) sexual reproduction is a lengthy process.
(B) gametes of parents have qualitatively different genetic composition.
(C) genetic material comes from parents of two different species.
(D) greater amount of DNA is involved in sexual reproduction.

Answers to MCQs

1.1 :	1.	(B)	2.	(B)	3.	(A)	4.	(B)	5.	(C)	6.	(A)	7.	(B)	8.	(A)	9.	(B)	10.	(D)
	11.	(A)	12.	(B)	13.	(C)	14.	(A)	15.	(B)	16.	(D)	17.	(C)	18.	(B)	19.	(A)	20.	(A)
	21.	(A)	22.	(D)	23.	(D)	24.	(C)	25.	(A)	26.	(C)	27.	(B)	28.	(A)	29.	(C)	30.	(A)
	31.	(A)	32.	(B)	33.	(B)	34.	(C)	35.	(B)	36.	(D)								
1.2 :	1.	(D)	2.	(A)	3.	(D)	4.	(C)	5.	(A)	6.	(B)	7.	(A)	8.	(D)	9.	(C)	10.	(A)
	11.	(B)	12.	(C)	13.	(D)	14.	(B)	15.	(A)	16.	(D)	17.	(A)	18.	(D)	19.	(A)	20.	(C)
	21.	(D)	22.	(A)	23.	(D)	24.	(A)	25.	(B)	26.	(A)	27.	(D)	28.	(C)	29.	(B)	30.	(A)
	31.	(C)	32.	(C)	33.	(B)	34.	(C)	35.	(D)	36.	(B)	37.	(B)	38.	(A)	39.	(B)	40.	(D)
	41.	(C)	42.	(D)	43.	(D)	44.	(B)	45.	(B)	46.	(C)	47.	(B)						

Solutions to MCQs

1.1 Asexual Reproduction

1. **(B)** **2.** **(B)** **3.** **(A)**

4. **(B)** **5.** **(C)** **6.** **(A)**

7. **(B)** **8.** **(A)** **9.** **(B)**

10. **(D)**

11. **(A)**
In *Amoeba*, sporulation occurs when favourable conditions return. Encystation or cyst formation occurs during unfavourable conditions. Thus cyst formation is not a part of sporulation.

12. **(B)** **13.** **(C)** **14.** **(A)**

15. **(B)** **16.** **(D)**

17. **(C)**
Fragmentation is an asexual mode of reproduction in which the body of some organisms break into distinct pieces (fragments). Each fragment grows into an adult capable of producing an offspring.

18. **(B)**
Zoospores are asexual reproductive structures.

19. **(A)** **20.** **(A)** **21.** **(A)**

22. **(D)**
Conidia are an asexual reproductive structure, while others are vegetative propagules in plants.

23. **(D)**

24. **(C)**
Water hyacinth or "Terror of Bengal" is an aquatic plant which is one of the most invading weeds that grows in the standing water. It takes oxygen from the water which causes death of fishes. Thus, also called as "blue devil".

25. **(A)** **26.** **(C)**

27. **(B)**
Meristematic cells are capable of dividing into new cells which can differentiate and give rise to permanent tissues.

28. **(A)**

29. **(C)**
Foliar (on the leaf) adventitious buds are formed at place other than nodes.

30. **(A)** **31.** **(A)** **32.** **(B)**

33. **(B)**

THINKING HATKE – Q. 33

In the given question, it is easy to identify that *Bryophyllum* gives rise to new plant by leaf buds. Therefore answer for (iii) is (a). This combination is observed in only option (B). The probability of having answer from other options is eliminated and the correct answer is (B).

34. **(C)**

35. **(B)**
For vegetative propagation of sugarcane, it requires atleast the presence of one node. A middle piece of a sugarcane internode can therefore not be used for propagation by vegetative means.

36. **(D)**
Plantlets always arise from nodes of stem or modified stem.

1.2 Sexual Reproduction

1. **(D)** **2.** **(A)** **3.** **(D)**

4. **(C)**
Bamboo species are monocarpic (flower generally only once in its life-time after 50- 100 years).
Jackfruit, papaya and mango are polycarpic (produce flowers and fruits many times in their life-time).

5. **(A)** **6.** **(B)**

7. **(A)**
Oestrus cycle is seen in rats and sheep.

8. **(D)**

9. **(C)**
Embryogenesis is a Post-fertilization event.

10. **(A)** **11.** **(B)**

12. **(C)**
Refer ***Smart Key - 1***
Monoecious and Homothallic are used to denote bisexual condition.

13. **(D)** **14.** **(B)**

15. **(A)**
When reproductive organs are present in same parent, such animals are called monoecious or bisexual or hermaphrodite.

16. **(D)**
Refer ***Smart Key - 1***
Marchantia is dioecious where the male plant bears Antheridiophore, female plant bears Archegoniophore.

17. **(A)** **18.** **(D)**

19. **(A)**
Cockroach is a unisexual animal, while others are bisexual.

20. **(C)** **21.** **(D)**

22. **(A)**
The cells in which meiosis takes place are called meiocytes.

23. **(D)**

24. **(A)**

Organism	Chromosome Number in Meiocyte (2n)
Fruit fly	8
House fly	12
Human being	46
Butterfly	380

25. **(B)**
Gamete (n) = 24
Meiocyte (2n) = $2 \times 24 = 48$

26. **(A)** **27.** **(D)** **28.** **(C)**

29. **(B)**
Pollen tube discharge male gametes near the egg.

30. **(A)**
Shoot tip cells and microspore mother cells both are diploid in maize plant.

31. **(C)**

32. **(C)**
Internal fertilization is seen in Bryophytes.

33. **(B)**
During sexual reproduction, meiosis occurs for the production of haploid gametes. External fertilization is not a rule during sexual reproduction, it can occur internally also.

34. **(C)** **35.** **(D)** **36.** **(B)**

37. **(B)** **38.** **(A)** **39.** **(B)**

40. **(D)**

41. **(C)**
Humans and mammals are viviparous.

42. **(D)** **43.** **(D)** **44.** **(B)**

45. **(B)**

46. **(C)**
Reproduction is a biological process in which an organism produces young ones (offspring) similar to itself. In both sexual and asexual reproduction, transfer of genetic material is involved and offsprings have some resemblance with parents.

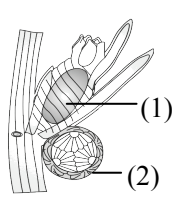
47. **(B)**

Topic Test

1. A mature seed contains _____, which is the progenitor of the next generation.
   (A) zygote (B) ovary
   (C) embryo (D) ovule

2. Identify the ODD one out.
   (A) Syngamy
   (B) Gametogenesis
   (C) Zygote
   (D) Zoospores

3. The diagram of a monoecious plant *Chara* is given below. Identify (1) and (2).



   (A) 1 – Antheridium; 2 – Oogonium
   (B) 1 – Oogonium; 2 – Antheridium
   (C) 1 – Carpel; 2 – Stamen
   (D) 1– Antheridiophore; 2 –Archegoniophore

4. Which one of the following is NOT a vegetative propagule?
(A) Gemmule (B) Rhizome
(C) Offset (D) Runner

5. *Strobilanthes kunthiana* flowers once in _____ years.
(A) 6 (B) 12
(C) 35 (D) 50-100

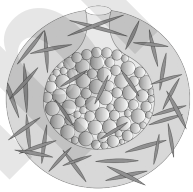
6. Match Column I (Name of Organism) and Column II (Life span) and choose the correct option.

	Column I (Name of organism)		**Column II** (Life span)
i.	Crow	a.	1-2 weeks
ii.	Butterfly	b.	100-150 years
iii.	Parrot	c.	15 years
iv.	Tortoise	d.	140 years

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

7. Identify the INCORRECT statement.
(A) External fertilization is seen in fishes and amphibians.
(B) Syngamy results in the formation of diploid zygote.
(C) Reptiles are oviparous animals.
(D) In flowering plants, the unisexual male flower is pistillate.

8. Identify the asexual reproductive structure shown in the diagram given below.



(A) Gemmule
(B) Buds
(C) Zoospores
(D) Conidia

9. Complete the analogy.
Rhizome : Ginger :: _____ : Water Hyacinth
(A) Bulbil
(B) Offset
(C) Adventitious buds
(D) Eyes

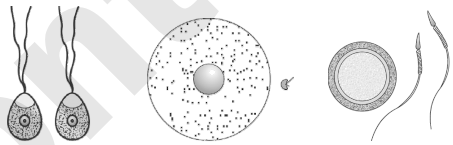
10. In an apple, the chromosome number in meiocyte is 34. What will be the chromosome number in its gamete?
(A) 34 (B) 20 (C) 71 (D) 17

11. Identify the INCORRECT match.
(A) Fishes – External fertilization
(B) Mammals – Internal fertilization
(C) Cockroach – Hermaphrodite
(D) Honeybees – Parthenogenesis

12. Which one of the following is NOT a vegetative propagule?
(A) Bulb (B) Zoospore
(C) Offset (D) Tuber

13. Choose the correct option which gives the correct sequence of arrangement of the given organisms in descending order of the chromosome in meiocyte?
(A) Dog > Butterfly > Fruit fly > Housefly
(B) Butterfly > Dog > Housefly > Fruit fly
(C) Housefly > Dog > Butterfly > Fruit fly
(D) Butterfly > Housefly > Dog > Fruit fly

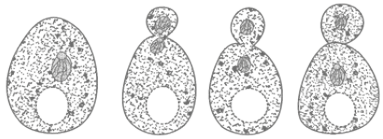
14. Identify the types of gametes in the diagram given below.



(1) (2) (3)

(A) 1 – Isogametes; 2 – Heterogametes; 3 – Heterogametes
(B) 1 – Heterogametes; 2 – Isogametes; 3 – Isogametes
(C) 1 – Homogametes; 2 – Isogametes; 3 – Heterogametes
(D) 1 – Isogametes; 2 – Homogametes; 3 – Heterogametes

15. Identify the type of asexual reproduction shown in the diagram given below.



(A) Gemmule formation
(B) Binary fission
(C) Budding
(D) Zoospore formation

Answers to Topic Test

1. (C) 2. (D) 3. (B) 4. (A)
5. (B) 6. (C) 7. (D) 8. (A)
9. (B) 10. (D) 11. (C) 12. (B)
13. (B) 14. (A) 15. (C)

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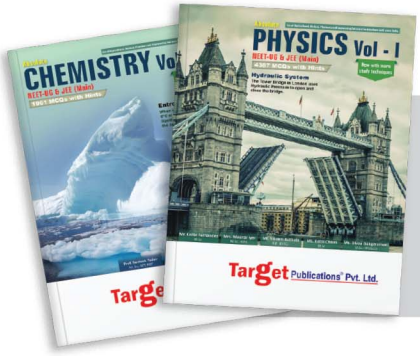

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