www.mtg.in | June 2016 | Pages 92 | ₹ 30

NEET SPECIAL

NEET Phase-1 Solved Paper 2016
(More than 60% Questions from MTG Books / Magazines)
NEET Phase-2 Practice Paper

MT
BIOLOGY today

India's #1
BIOLOGY MONTHLY FOR
MEDICAL ENTRANCE EXAMS

High Yield Facts
- Reproductive Health
- Monerans & Fungi

Concept Map
Sexual Reproduction

PMT Essential
Morphology of Flowering Plants-III

mtG
Trust of more than
1 Crore Readers
Since 1982

PMT FOUNDATION

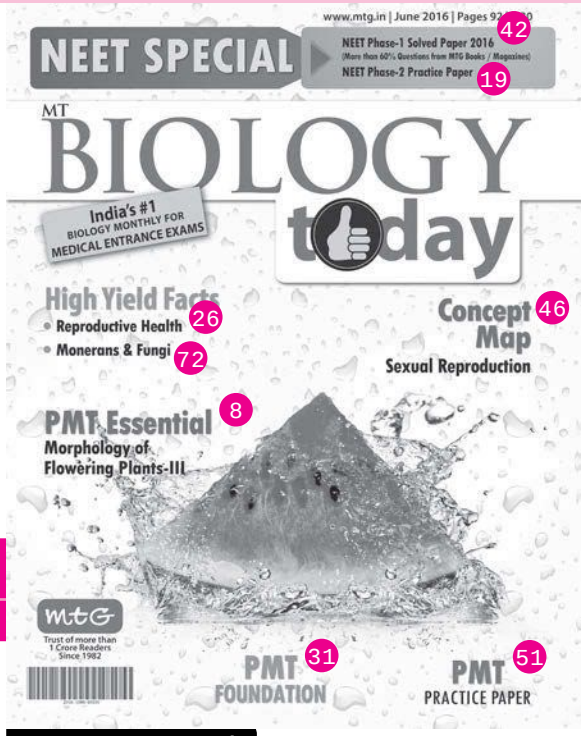
PMT PRACTICE PAPER

MT BIOLOGY today

Vol. XVIII No. 6 June 2016

Corporate Office:
Plot 99, Sector 44 Institutional Area,
Gurgaon -122 003 (HR), Tel : 0124-6601200
e-mail : info@mtg.in website : www.mtg.in

Regd. Office:
406, Taj Apartment, Near Safdarjung Hospital,
Ring Road, New Delhi - 110029.
Managing Editor : Mahabir Singh
Editor : Anil Ahlawat



Subscribe online at www.mtg.in

CONTENTS

8 PMT Essential (XI)
Morphology of Flowering Plants-III

19 NEET (Phase-II)
Practice Paper 2016

26 High Yield Facts-Zoology
Reproductive Health (XII)

31 PMT Foundation (XI)

42 NEET (Phase-I)
Solved Paper 2016

46 Concept Map (XII)

50 Bio-Reporter
A Bizarre Sea Creature & Packaged Air

51 Practice Paper-PMT

62 Crossword

72 High Yield Facts-Botany
Monerans & Fungi (XI)

Individual Subscription Rates

	1 yr.	2 yrs.	3 yrs.
Mathematics Today	330	600	775
Chemistry Today	330	600	775
Physics For You	330	600	775
Biology Today	330	600	775

Combined Subscription Rates

	1 yr.	2 yrs.	3 yrs.
PCM	900	1500	1900
PCB	900	1500	1900
PCMB	1000	1800	2300

TO OUR READERS

We are happy that intelligent students, teachers and other professionals continue to patronise Mathematics Today, Chemistry Today, Physics For You and Biology Today.

To them, we are addressing this open letter in view of increase in the cost of production and postage in the last five years. All round spiralling prices have pushed production costs so high, that many in out fraternity find it impossible to continue business. We are compelled to raise the price to ₹ 40 from July 2016 issue.

We understand the pressure of cost on the student-teacher community in general but, we are hoping our readers will understand our problems and that we have no option but to comply with this unavoidable move.

We on our part, will keep up our efforts to improve the magazines in all its aspects.

Send D.D/M.O in favour of MTG Learning Media (P) Ltd.
Payments should be made directly to : MTG Learning Media (P) Ltd,
Plot 99, Sector 44 Institutional Area, Gurgaon - 122 003, Haryana.
We have not appointed any subscription agent.

Owned, Printed and Published by Mahabir Singh from 406, Taj Apartment, New Delhi - 29 and printed by Personal Graphics and Advertisers (P) Ltd., Okhla Industrial Area, Phase-II, New Delhi.

Editor : Anil Ahlawat

PMT ESSENTIAL

The content for PMT Biology is very vast and does not allow students to engage in inquiry and develop meaningful knowledge. An *essential topic for PMT* is presented here to enable students grasp the topic, analyse the type of questions appearing in PMTs, and SCORE HIGH.

MORPHOLOGY OF FLOWERING PLANTS - III

FRUIT

True fruit or **eucarp** is a structure formed from ripened ovary under the influence of ripening ovules and is meant for protecting them. It consists of pericarp formed from the wall of the ovary and seeds formed from ovules. *E.g.*, mango, brinjal, tomato, cucumber, pea, etc. When in formation of a fruit other floral parts, (*e.g.*, thalamus, base of sepal, petals, etc.) participate, it is called false fruit or **pseudocarp**, *e.g.*, apple, pear etc.

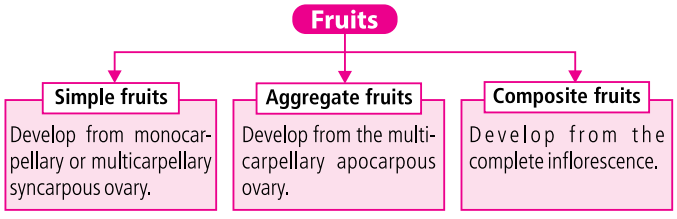
A fruit formed without fertilisation *i.e.*, a seedless fruit is called **parthenocarp**, *e.g.*, banana.

Classification of fruits

Fruits are classified into various types according to the structure of pericarp, mode of dehiscence and the ovary from which they have developed.

Simple fruits

Simple fruits can be **simple dry** fruits, which possess thin hard and dry pericarp or **succulent (or simple fleshy)** fruits in which the **pericarp is flesh**, edible and differentiated into three layers: epicarp, mesocarp and endocarp.



Simple dry fruits

In these fruits pericarp is not distinguished in three layers. They may be dehiscent (capsular), indehiscent (achenial) and splitting (schizocarpic).

(i) **Capsular or dehiscent fruits :** These fruits are many seeded where pericarp splits open at maturity to expose seeds.

Types

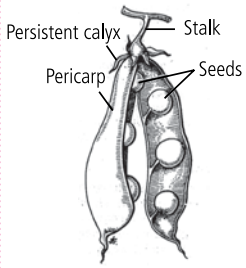


Fig.: Legume of pea

Legume or Pod
This develops from a superior, monocarpellary, unilocular ovary with marginal placentation and it dehisces by both ventral and dorsal sutures. It is characteristic of Family Fabaceae *e.g., Pisum sativum, Dolichos lablab* etc.

Siliqua
The fruit develops from bicarpellary, syncarpous, superior ovary having parietal placentation. The ovary is unilocular but later becomes bilocular due to development of a false septum, called replum. It dehisces from the base towards the apex by both the sutures. It is characteristic of Family Brassicaceae. *e.g., Brassica.*

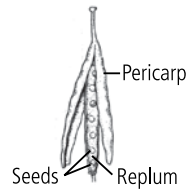


Fig.: Siliqua of mustard

Silicula
It is a few seeded shortened and flattened siliqua, *e.g.,* candytuft (*Iberis*), Shepherd's purse (*Capsella*).

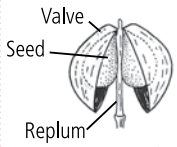


Fig.: Silicula of *Iberis*

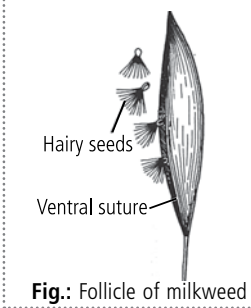


Fig.: Follicle of milkweed

Follicle
It is similar to legume in all characters except that it dehisces from one suture only, *e.g., Delphinium, Calotropis.*

Capsule
These fruits develop from multicarpellary syncarpous, superior or inferior ovary. These are multilocular and many seeded fruits and dehisce by various ways. Depending upon the mode of dehiscence, capsules may be loculicidal, septicidal, septifragal, denticidal, pyxidium or porocidal.

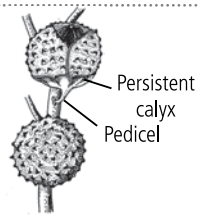


Fig.: Capsule of *Datura*

(ii) **Achenial or indehiscent fruits :** These fruits develop from single ovuled ovary having basal placentation and so are single seeded. These fruits do not burst at maturity but only the decaying of pericarp liberates the seeds.

Types

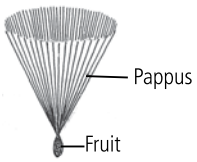


Fig.: Cypsela of *Sonchus*

Cypsela
The fruit is produced from bicarpellary, syncarpous, inferior ovary. Persistent hairy calyx (pappus) are attached with the fruit. Pericarp is free from seed coat. *E.g. Sonchus, Tagetes.*

Achene
A small fruit which develops from a monocarpellary superior ovary. Pericarp is hard and remains free from seed coat except at one point. *E.g., Mirabilis, Clematis.*

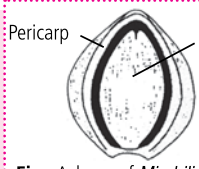


Fig.: Achene of *Mirabilis* (L.S)

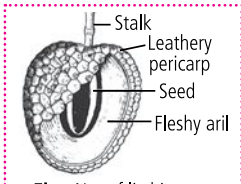


Fig.: Nut of litchi

Nut
It is dry fruit which develops from a superior, bi or multicarpellary ovary having a hard and woody pericarp, rarely leathery, *e.g.,* litchi, cashewnut, etc.

Caryopsis or Grain
Pericarp and seed coat are inseparably fused with each other, *e.g.,* members of Family Poaceae (= Gramineae).

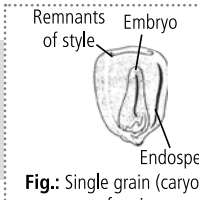


Fig.: Single grain (caryopsis) of maize

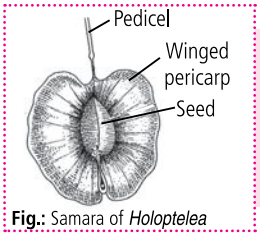


Fig.: Samara of *Holoptelea*

Samara
A dry fruit which develops from bicarpellary, syncarpous ovary. Pericarp bears membranous outgrowths called wings for wind dispersal, *e.g., Holoptelea, Ulmus,* etc.

To know about Ravine Trapdoor spider go to page no. 83

(iii) **Schizocarpic or splitting fruits :** These are many seeded, dry and simple fruits that break up into single seeded parts. The indehiscent single seeded parts are called **mericarps** while the dehiscent ones are termed as **cocci** (singular coccus).

Types

Lomentum

It develops from mono-carpellary, superior, unilocular ovary. The fruit arises just like a legume but when ripened, it forms single seeded mericarps, *e.g.*, *Mimosa pudica*, *Arachis hypogea* etc.

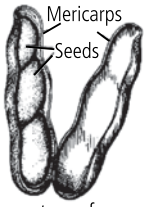


Fig.: Lomentum of groundnut

Double samara

Fruits develop from bicarpellary, syncarpous, superior ovary. Pericarp in these fruits develops in two wings. On maturity the fruit splits up into winged single seeded mericarps, *e.g.*, *Acer*.

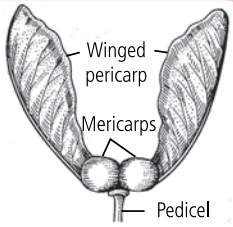


Fig.: Double samara of *Acer*

Carcerulus

Fruits develop from bicarpellary, syncarpous, superior ovary. Many single seeded mericarps are formed by splitting, *e.g.*, *Althaea*, *Abutilon*, etc.

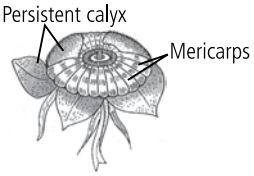


Fig.: Carcerulus of *Althaea*

Cremocarp

Bilocular, two-seeded fruits which develop from bicarpellary syncarpous, inferior ovary. On maturation these divide along with carpophore (apically grown part of thalamus) into two mericarps, each having one seed, *e.g.*, coriander (*Coriandrum sativum*), carrot etc.

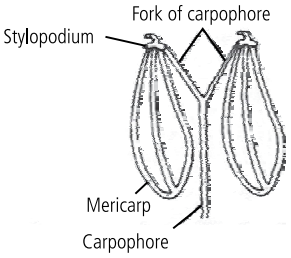


Fig.: Cremocarp of coriander

Regma

These fruits develop from multicarpellary pistil. On maturity, the fruits split up into single-seeded dehiscent parts called cocci *e.g.*, castor (*Ricinus*), *Geranium*, etc.

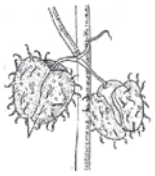


Fig.: Regma of castor

UNSCRAMBLED WORDS

APRIL 2016

1. ANDROGENESIS	2. OBTURATOR
3. PALAEOGNATHAE	4. ECHOLOCATION
5. CASPASES	6. ONTOGENY
7. PHYTOALEXIN	8. APOMORPHY
9. MYDRIASIS	10. LENTICELS

Winners : *Anushree Mandal (West Bengal), Chinmayi Rajpurohit, Swastik Biswas (West Bengal), Ariz Faiyaz (Bihar)*

ANSWERS *WHO AM I ...*

1. Lactational Amenorrhea — Pg. 65
2. Plasmid — Pg. 77

"At first I was happy I made smart transgenic mice."

TIT-BITS...

mtG

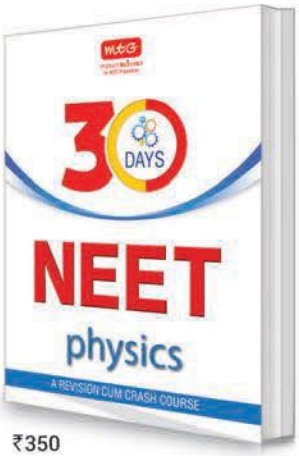
NEET

A Revision cum Crash Course

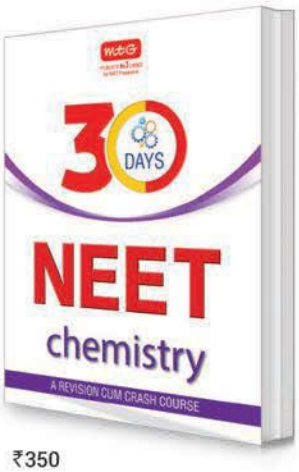
TEST YOURSELF

PUSH YOUR LIMITS

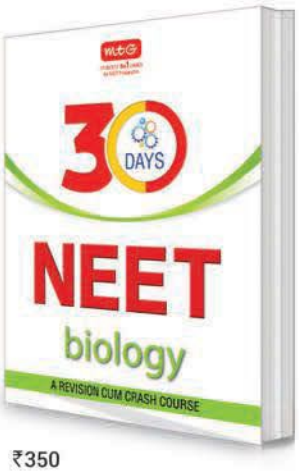
REACH FOR YOUR PEAK POTENTIAL



₹350



₹350



₹350

Key Features

- Syllabus systematically divided into 30 days
- NCERT based crisp theory
- Exam Drill exercises for each day with detailed solutions
- OMR sheets at the end of each exercise to improve the skills to attempt actual question paper
- 5 Unit Tests for formative assessment during the preparation
- 2 Mock Test Papers at the end to give the real exam feeling
- NEET (Phase -1) 2016 solved paper

Visit **www.mtg.in** for latest offers and to buy online!

Available at all leading book shops throughout India. To buy online visit www.mtg.in.
For more information or for help in placing your order,
call 0124-6601200, 1800 300 23355 (Toll Free) or e-mail *info@mtg.in*

Also available on Flipkart, Snapdeal, Amazon, Infibeam on cash on delivery

Simple succulent fruits

In these fruits, the pericarp and its associated parts become fleshy. These are of following types:

Types

Drupe

The endocarp is hard and stony. Hence, drupes are also called **stone fruits.** Epicarp forms the outer skin; mesocarp is thick, fleshy, juicy and edible as in mango (*Mangifera indica*) and fibrous as in coconut (*Cocos nucifera*). In cherry, peach, plum and *Zizyphus*, both epicarp and mesocarp are edible.

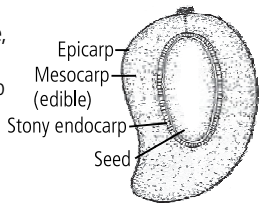


Fig.: Drupe of mango (L.S)

Pome

This is false fruit that develops from inferior compound ovary. The outer fleshy part of fruit is thalamus. *E.g.*, apple (*Pyrus malus*), pear (*Pyrus communis*).

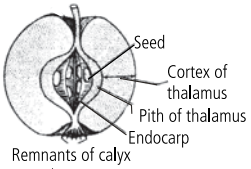


Fig.: Pome of apple (L.S)

Hesperidium

These fruits develop from multicarpellary, syncarpous multilocular, superior ovary with axile placentation. Outer glandular skin is epicarp, the white fluffy stuff is mesocarp and inner membrane surrounding the locules is endocarp. Each loculus of the fruit encloses one or more seeds and a number of edible juicy placental hair, *e.g.*, lemon, orange, etc.

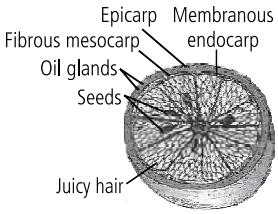


Fig.: Hesperidium of orange (T.S)

Berry

These fruits develop from mono or multicarpellary syncarpous ovary. True berries are derived from superior ovaries and all the 3 layers of their fleshy pericarp are edible, *e.g.*, grape, tomato, etc. False berries are derived from inferior ovaries where epicarp is fused with the thalamus to form exocarp, *e.g.*, guava, banana, etc.

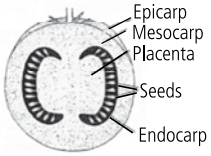


Fig.: Berry of tomato (L.S)

Balausta

The fruit develops from multilocular, syncarpous, inferior ovary. Testa (outer seed coat) is fleshy and forms edible part of the fruit. Tegmen (inner seed coat) is hard. Pericarp is rough and leathery and seeds are irregularly arranged in the fruit. Fruit has persistent calyx. *E.g.*, pomegranate.

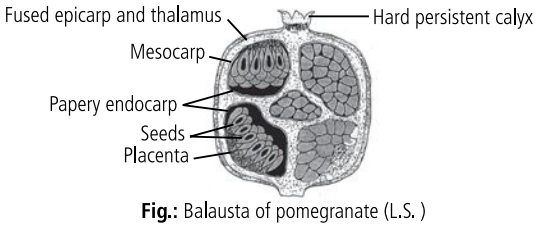


Fig.: Balausta of pomegranate (L.S.)

Amphisarca

The fruit develops from multicarpellary, syncarpous, superior ovary. Epicarp becomes woody. Mesocarp, endocarp and swollen placenta are eaten, *e.g.*, wood apple (*Aegle marmelos*).

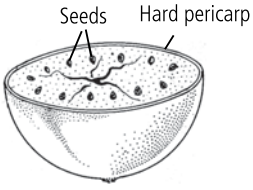


Fig.: Amphisarca of wood apple (T.S)

Pepo

These fruits are special type of false berries that develop from inferior ovary with parietal placentation. Here exocarp of rind does not separate from mesocarp. Rind may or may not be edible. *E.g.*, cucumber (*Cucumis sativa*) etc.

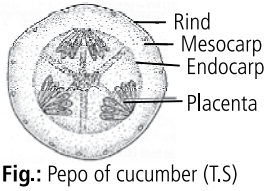


Fig.: Pepo of cucumber (T.S)

Aggregate fruits

An aggregate fruit or etaerio is a group of fruitlets which develop from multicarpellary apocarpous ovary. Aggregate fruits are of following main types:

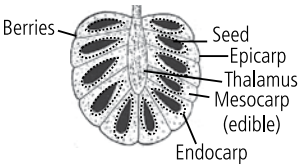


Fig.: Etaerio of berries of custard apple (L.S)

Etaerio of berries

It develops from a polycarpellary ovary. Each carpel develops into a berry and a number of berries lie embedded in the thalamus, and look like a single fruit, *e.g.*, custard apple (*Annona squamosa*).

Etaerio of achenes

It is an aggregation of achenes (single-seeded, dry indehiscent fruitlets where seeds are attached to the pericarp at one point. *E.g.*, *Rosa indica*, *Nelumbo*, *Clematis* etc.

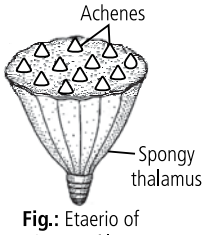


Fig.: Etaerio of achenes of lotus

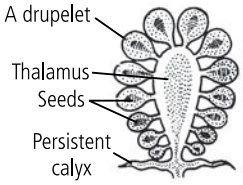


Fig.: Etaerio of drupes in raspberry (L.S)

Types

It is an aggregation of many small drupes, developed from different carpels and arranged collectively (in groups) on the fleshy thalamus *e.g.*, raspberry, blackberry.

Etaerio of drupes

It is an aggregation of follicles developed from a flower with apocarpous pistil. Many follicles are arranged on the enlarged thalamus in a bunch, *e.g.*, champa (*Michelia*), madar (*Calotropis*) etc.

Etaerio of follicles

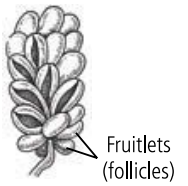


Fig.: Etaerio of follicles in *Michelia*

Composite or multiple fruits

A composite or multiple fruit is a group of fruitlets which develop from flowers of an inflorescence.

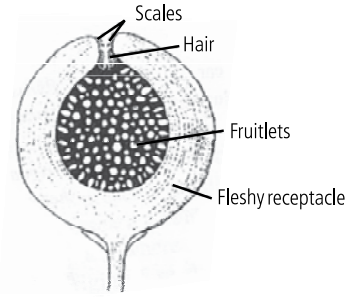


Fig.: Syconus of fig

Types

Sorosis

The composite fruit develops from either a spike or female catkin, *e.g.*, mulberry (*Morus*), pineapple, jack-fruit. The sorosis fruit of mulberry develops from a female catkin. In mulberry ovaries of the individual flowers develop into minute seedless fruitlets or nutlets (= achenes). Their perianth lobes (4 in number) become fleshy and juicy. The whole fruit is edible.

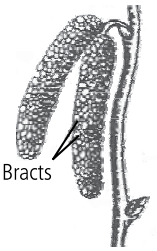


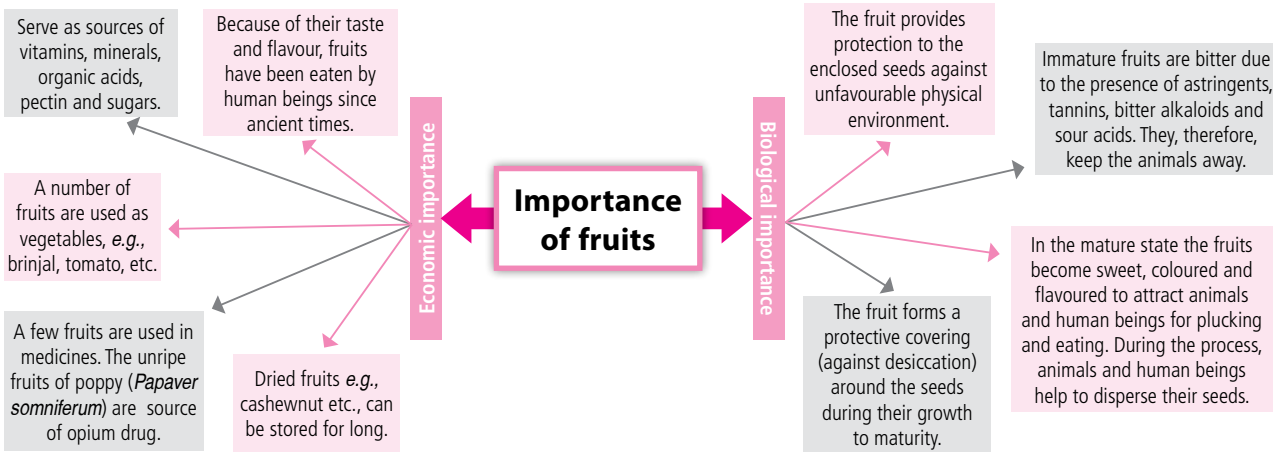
Fig.: Sorosis of *Morus*

Syconus

It develops from hypanthodium type of inflorescence, *e.g.*, peepal (*Ficus religiosa*), Banyan (*Ficus benghalensis*), Fig (*Ficus carica*). The flask-shaped receptacle becomes fleshy. The enclosed female flowers may produce small achene-like fruitlets. Syconus has a small pore protected by scale leaves.

Table : Differences between aggregate and composite fruits

	Aggregate fruit	Composite fruit
(i)	It develops from a single flower.	It develops from an inflorescence.
(ii)	It has two or more fruitlets which develop from free ovaries of the single flower.	It has several fruitlets which develop from different flowers of the inflorescence.



SEED

Seed is a ripened ovule which contains an embryo or miniature plant in suspended condition, adequate reserve food for future development of the embryo and a covering for protection against mechanical injury, loss of water, pathogens, etc.

The embryo consists of an axis or **tigellum,** to which are attached, one (in monocotyledonous seeds) or two (in dicotyledonous seeds) seed leaves or **cotyledons.**

Types of seeds

Endospermic or albuminous seeds
Contain endosperm as the reserve food material, *e.g.*, maize, castor etc.

Non-endospermic or ex-albuminous seeds
Endosperm is consumed during seed development and the food is stored in cotyledons and other regions, *e.g*, orchids, gram etc.

Recalcitrant seeds are those that get killed on reduction of moisture and exposure to low temperature *e.g.*, *Cocos*, *Thea* and *Artocarpus*.

Orthodox seeds are those that can be stored for long as they can tolerate reduction in moisture content (upto 5%), exposure to anaerobic conditions and low temperature *e.g.*, legumes and cereals.

Structure of gram seed

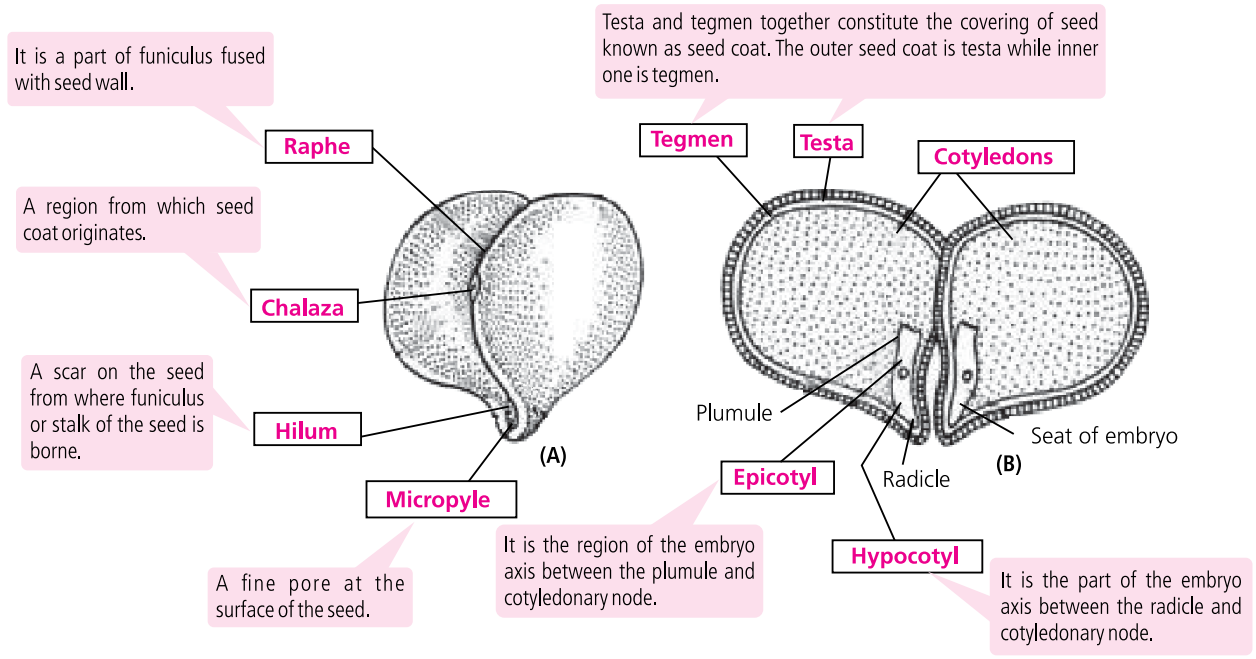


Fig.: Structure of gram seed. **(A)** Complete seed showing various parts; **(B)** L.S. of seed

Structure of maize seed

The monocotyledonous seeds possess a single cotyledon and are generally endospermic.

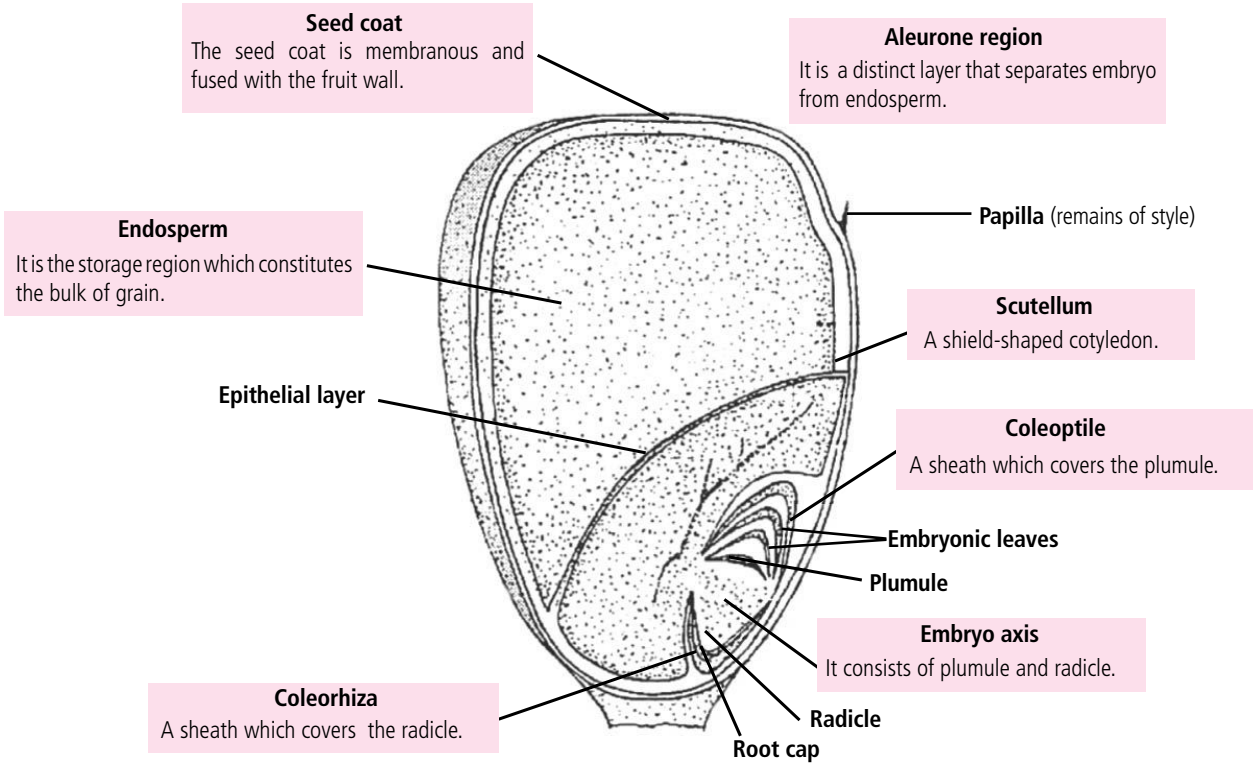


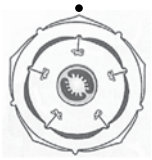
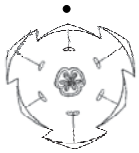
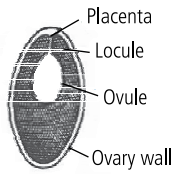
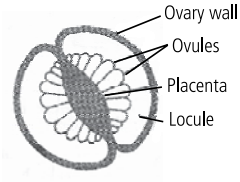
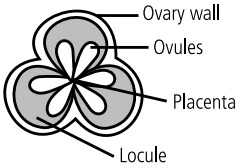
Fig : L.S of maize grain (seed)

DESCRIPTION OF SOME IMPORTANT ANGIOSPERMOUS FAMILIES

Floral formula is the summarised account of the floral characters of a plant or a family represented by symbols, whereas **floral diagram** is a diagrammatic representation of the pooled up informations from transverse sections of the flower bud in relation to mother axis.

Table : A comparative account of Families Fabaceae, Solanaceae and Liliaceae

Characters	Fabaceae	Solanaceae	Liliaceae
Systematic position	Class – Dicotyledonae Subclass – Polypetalae Series – Calyciflorae Order – Rosales Family – Fabaceae	Class – Dicotyledonae Subclass – Gamopetalae Series – Bicarpellatae Order – Polemoniales Family – Solanaceae	Class – Monocotyledoneae Series – Coronarieae Order - Liliales Family – Liliaceae
Inflorescence	Raceme or spike (panicle in *Dalbergia*)	Axillary or extra-axillary cyme, rarely solitary axillary (*Petunia*) or terminal (*Datura*)	Racemose, sometimes solitary or umbellate
Flower	Bisexual, zygomorphic, bracteate or ebracteate, pedicellate or sessile, peri or occasionally hypogynous, pentamerous	Bisexual, actinomorphic, ebracteate or bracteate, pedicellate, hypogynous, pentamerous, cyclic	Bisexual, actinomorphic, zygomorphic in few cases, bracteate or ebracteate, pedicellate, complete or incomplete, unisexual in *Ruscus* and *Smilax*, hypogynous, generally pentacyclic, trimerous

Calyx	Sepals five, gamosepalous, valvate or imbricate aestivation, usually campanulate	Sepals five, gamosepalous, valvate aestivation, persistent, accrescent (*Physalis*), campanulate or tubular, hairy	**Perianth :** Tepals six (3 + 3), often united into tube, valvate or imbricate aestivation, sepaloid or petalloid
Corolla	Petals five, polypetalous, papilionaceous, imbricate aestivation	Petals five, variously shaped, infundibulum, campanulate, rotate, united, valvate aestivation, plicate or folded like a fan in bud	
Androecium	Ten, usually diadelphous [(9) + 1], anthers dithecous, introrse, dehiscence longitudinal	Stamens five, epipetalous, filaments free, anthers bithecous, basifixed or dorsifixed, introse, longitudinal or porous dehiscence.	Stamens six (3 + 3), free or monadelphous (*e.g.*, *Ruscus*), epiphyllous, basifixed, dorsifixed, or versatile anther, longitudinal dehiscence
Gynoecium	Ovary superior, monocarpellary, unilocular with many ovules, marginal placentation	Bicarpellary, syncarpous, ovary superior, bilocular, sometimes tetralocular due to false septum, placenta swollen with many ovules, axile placentation, ovary is obliquely placed	Tricarpellary, syncarpous, superior ovary, trilocular with 2-many ovules, axile placentation, rarely parietal, styles united or separate, stigma free or fused, trilobed
Fruit	Legume rarely lomentum	Berry or capsule	Capsule, rarely berry
Seeds	One to many, non-endospermic	Many, endospermous	Endospermous
Floral formula	% ♂ ♀ $K_{(5)}\ C_{1+2+(2)}\ A_{(9)+1}\ \underline{G_1}$	⊕ ♂ ♀ $K_{(5)}\ \overset{\frown}{C_{(5)}}\ A_5\ \underline{G_{(2)}}$	♂ ♀ $\overset{\frown}{P_{3+3 \text{ or } (3+3)}}\ A_{3+3}\ \underline{G_{(3)}}$
Floral diagram			
T.S. Ovary			

POWER EXERCISE

New MCQs

1. Which of the following is a true fruit?
   (a) Banana (b) Fig
   (c) Apple (d) Pear
2. Aril represents the edible part of
   (a) mango (b) apple
   (c) banana (d) litchi.
3. Edible part in mango is
   (a) mesocarp (b) epicarp
   (c) endocarp (d) epidermis.
4. Juicy hair-like structures observed in the lemon fruit develop from
   (a) exocarp (b) mesocarp
   (c) endocarp (d) mesocarp and endocarp.

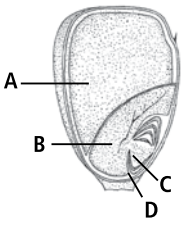
5. The fleshy receptacle of syconus of fig encloses a number of
(a) berries (b) mericarps
(c) achenes (d) samaras.

6. The fruit is chambered, developed from inferior ovary and has seeds with succulent testa in
(a) guava (b) cucumber
(c) pomegranate (d) orange.

7. A fruit developed from hypanthodium inflorescence is called
(a) sorosis (b) syconus
(c) caryopsis (d) hesperidium.

8. Composite fruit develops from
(a) single ovary (b) inflorescence
(c) apocaropous ovary (d) pericarp.

9. The given figure shows L.S of the seed of maize. What do A, B, C and D represent?
(a) A : endosperm B : scutellum
C : plumule D : coleoptile
(b) A : scutellum B : pericarp
C : radicle D : coleoptile
(c) A : endosperm B : scutellum
C : radicle D : coleorhiza
(d) A : scutellum B : pericarp
C : plumule D : coleorhiza



10. The seed of wheat is
(a) berry (b) nut
(c) caryopsis (d) etaerio.

Exam Section

1. The wheat grain has an embryo with one large, shield shaped cotyledon known as
(a) scutellum (b) coleoptile
(c) epiblast (d) coleorhiza. *(AIPMT 2015)*

2. Edible part of a coconut fruit is
(a) endocarp (b) mesocarp
(c) endosperm (d) epicarp. *(UP CPMT 2015)*

3. Placenta and pericarp are both edible portions in
(a) apple (b) banana
(c) tomato (d) date palm. *(AIPMT 2014)*

4. Which one of the following statements is correct?
(a) The seed in grasses is not endospermic.
(b) Mango is a parthenocarpic fruit.
(c) A proteinaceous aleurone layer is present in maize grain.
(d) A sterile pistil is called a staminode. *(AIPMT 2014)*

5. An aggregate fruit is one which develops from
(a) multicarpellary syncarpous gynoecium
(b) multicarpellary apocarpus gynoecium
(c) complete inflorescence
(d) multicarpellary superior ovary. *(AIPMT 2014)*

6. In apple, the edible portion is
(a) mesocarp (b) epicarp
(c) endocarp (d) thalamus. *(WB JEE 2014)*

7. Seed coat is not thin and membranous in
(a) groundnut (b) gram
(c) maize (d) coconut. *(NEET 2013)*

8. Albuminous seeds store their reserve food mainly in
(a) endosperm (b) cotyledons
(c) hypocotyl (d) perisperm.
(NEET-Karnataka 2013)

9. Endosperm is completely consumed by the developing embryo before seed maturation in
(a) pea, groundnut and castor
(b) groundnut, bean and coconut
(c) pea, groundnut and bean
(d) none of these. *(AMU 2013)*

10. Fruit of grapevine is
(a) siliqua (b) lomentum
(c) berry (d) drupe. *(Odisha 2012)*

Assertion & Reason

The following questions consist of two statements each : assertion (A) and reason (R). To answer these questions, mark the correct alternative as directed below :

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

1. **Assertion (A) :** The fruit of tomato is a true berry.
Reason (R) : The fruit of tomato is derived from superior ovary.

2. **Assertion (A) :** Simple samara is single seeded indehiscent dry fruit where pericarp forms wings.
Reason (R) : Fruit of *Holoptelea* is simple samara.

3. **Assertion (A) :** Orange fruit is a hesperidium which is many chambered and each chamber encloses a number of edible juicy placental hair.
Reason (R) : Hesperidium is a special type of inferior berry which is derived from polycarpellary, apocarpous inferior ovary with marginal placentation.

4. **Assertion (A) :** Hilum is a scar on seed where funiculus or stalk of seed is borne.
Reason (R) : Some seeds show chalaza (part of funiculus fused with seed wall) and raphe (place of origin of seed coats).

5. **Assertion (A) :** Castor, rubber and coconut are non-endospermic seeds.
Reason (R) : In non-endospermic seeds food reserve remains in the endosperms.

Short Answer Type Questions

1. Fill in the blanks:
   (a) Cypsela is a _____ fruit and is derived from _____ ovary.
   (b) The fruit of *Capsella* is _____.
   (c) Compound samara is a _____ fruit which splits up at maturity into single seeded _____.
   (d) Edible part of pomegranate is bright red juicy _____ of seed.
   (e) The _____ is the outgrowth of micropylar region of castor oil seed.
2. Describe the internal structure of maize grain. Draw well labelled diagram of L.S. of maize grain.
3. Describe any two aggregate fruits with the help of well labelled diagrams.
4. How will you differentiate between a simple, aggregate and composite fruit?

ANSWER KEY

New MCQs

1.	(a)	2.	(d)	3.	(a)	4.	(c)	5.	(c)
6.	(c)	7.	(b)	8.	(b)	9.	(c)	10.	(c)

Exam Section

1.	(a)	2.	(c)	3.	(c)	4.	(c)	5.	(b)
6.	(d)	7.	(d)	8.	(a)	9.	(c)	10.	(c)

Assertion & Reason

1.	(a)	2.	(b)	3.	(c)	4.	(c)	5.	(d)

Short Answer Type Questions

1. (a) pseudocarpic, bicarpellary inferior
   (b) silicula (c) winged, mericarps
   (d) testa (e) caruncle
2. Maize grain is a single seeded fruit (caryopsis) where fruit wall (pericarp) and the seed coat (testa) are inseparably fused.

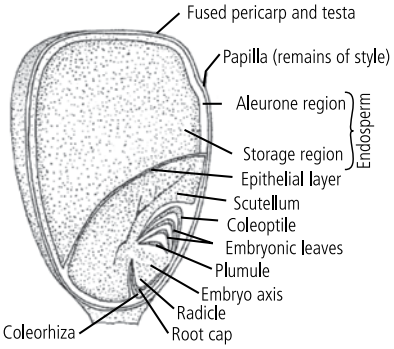


Fig.: L.S. of maize grain

Grain is covered by a single, thin but hard covering (formed by fusion of testa and pericarp). Within the covering are present two structures - endosperm and embryo.

The endosperm occupies most of the interior of the grain on the broader and the lower sides. It consists of two parts, horny aleurone and mealy storage. The aleurone region lies immediately below the grain covering. It is 1-3 celled thick. The cells have thick walls and dense cytoplasm filled with aleurone or protein grains. The latter produce enzymes during the process of grain germination. The storage region of endosperm is whitish or yellowish. It has large thin walled cells with disintegrated cytoplasm and rich in starch grains. The cells also possess fats and proteins.

The embryo occurs in the pointed part of the grain, mostly towards the upper side. It consists of an embryo axis containing a radicle, a plumule and a single lateral cotyledon (known as scutellum). The radicle (or future first root) lies at pointed end of the grain. It has two protective sheaths, inner root cap and outer coleorhiza. The plumule (or future shoot) lies towards the broader side of the grain at the other end of embryo axis. It bears a few rudimentary leaves and a conical protective sheath known as coleoptile. Coleoptile has a terminal pore for the emergence of first leaf during germination. The sheath is capable of growth. It assists the future shoot in passing through the soil during germination.

3. (i) Etaerio of achenes : It is an aggregate fruit in which the individual fruitlets are achenes (dry single-seeded indehiscent fruitlets in each of which the seed is attached to the dry pericarp at one point) *e.g.*, buttercup (*Ranunculus*), *Clematis*. In lotus the achenes are embedded in the upper part of spongy thalamus that assists the fruit in floating over water. Strawberry has brownish achenes embedded over the surface of fleshy and edible thalamus.

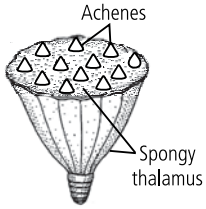


Fig.: Etaerio of achenes of lotus

(ii) Etaerio of berries : In this fruit, the individual berries are fused together around an elongated central axis. They are demarcated from outside by hexagonal areas. The edible part is the juicy mesocarp of individual berries. Endocarp is thin and is often discarded alongwith seed. *E.g.*, custard apple.

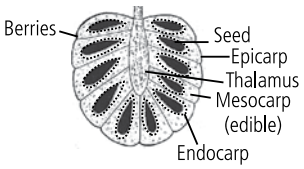


Fig.: Etaerio of berries of custard apple (L.S)

4. A simple fruit develops from a monocarpellary or multicarpellary syncarpous ovary of a flower. An aggregate fruit or etaerio is a group of simple fruitlets that develop from the multicarpellary apocarpous ovary of a single flower whereas a composite or multiple fruit is a group of fruitlets which develop from the complete inflorescence.

☺☺

BOOST your NEET score

Practice paper for phase II

1. Herbarium is one of the important tools that were used for identification of plants. Which one of the following is correct regarding it?
(a) It provides information about the local flora and fauna of that region.
(b) The information provided by them are useful in locating wild varieties and relatives of economically important plants.
(c) The new material added to the collection of herbarium is known as acquisition.
(d) It provides living plant material for systematic work.

2. Which of the following protists is earlier placed under Class Phytomastigophora of Protozoa?
(a) Desmids (b) Euglenoids
(c) Diatoms (d) Dinoflagellates

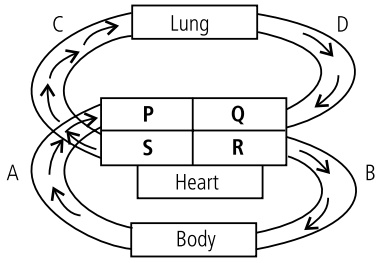
3. An insectivorous angiosperm in which roots are absent is
(a) *Utricularia* (b) *Rhizophora*
(c) *Nepenthes* (d) *Dracena*.

4. The organic substance present in mesophyll cells are passed into the sieve tubes through their companion cells by
(a) an active transport (b) simple diffusion
(c) facilitated diffusion (d) osmosis.

5. Guttation takes place through
(a) stomata (b) hydathodes
(c) water pore (d) both (b) and (c).

6. Which enzyme of TCA/Krebs cycle is not present in mitochondrial matrix?
(a) Malate dehydrogenase
(b) Citrate synthase
(c) Aconitase
(d) Succinate dehydrogenase

7. Which statement is correct for the given diagram?



(i) Q receives oxygenated blood from lungs through pulmonary artery.
(ii) Vena cava A carries deoxygenated blood to right atrium P.
(iii) Carotid artery B transports oxygenated blood from left ventricle R to different body tissues.
(iv) Pulmonary artery C carries carbon dioxide rich blood from right ventricle S to lungs.
(a) (iii) only (b) (ii) and (iv)
(c) (i), (iii) and (iv) (d) (i), (ii) and (iii)

8. Bowditch's Law states that
(a) minimum specific strength of stimulus is required for muscle contraction
(b) a muscle fibre contracts, sustained for a short period only once if stimulated by single nerve impulse
(c) partial muscle contraction, sustained for a short period, maintains posture of the body
(d) when a muscle fibre contracts, it contracts maximally.

9. Which hormone promotes synthesis of carbohydrates from non-carbohydrates and stimulates degradation of proteins?
(a) Calcitonin (b) Cortisone
(c) Corticosterone (d) Cortisol

10. Gluconic acid is prepared by the activity of _____ and formation of lipases involved _____.
(a) *Acetobacter aceti, Candida lipolytica*
(b) *Rhizopus, Aspergillus niger*
(c) *Aspergillus niger, Candida lipolytica*
(d) *Monascus purpureus, Geotrichum candidum*

11. Which among the following is an inverted pyramid?
(a) Pyramid of energy in grassland.
(b) Pyramid of number in pond ecosystem.
(c) Pyramid of number in grassland.
(d) Pyramid of biomass in an aquatic system.

12. Match column I with column II and select the correct option.

	Column I		**Column II**
1.	Golden rice	p.	High protein content
2.	*Brassica napus*	q.	*Cry* I *Ab*
3.	*Bt* corn	r.	β-carotene
4.	Transgenic potato	s.	Hirudin

(a) 1-s, 2-p, 3-r, 4-q (b) 1-r, 2-s, 3-q, 4-p
(c) 1-q, 2-r, 3-p, 4-s (d) 1-q, 2-s, 3-p, 4-r

13. Identify labels 1-5 in the given flow chart showing hormonal control of male reproductive system and select the correct option.

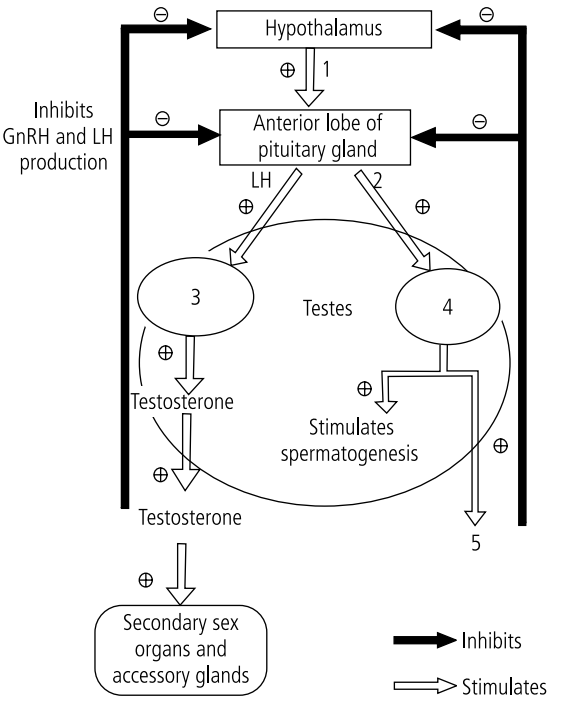


Fig.: Hormonal control of male reproductive system

(a) 1-FSH, 3-Leydig cells, 4-Sertoli cells
(b) 1-GnRH, 3-Interstitial cells, 5-Inhibin
(c) 2 GnRH, 4-Leydig cells, 5-Androgen binding protein
(d) 1-GnRH, 2-Androgen binding protein, 4-Seminiferous tubule.

14. Read the given statements.
(i) In prokaryotes, the photosynthetic pigments are found in the _____.
(ii) DCMU is a herbicide which blocks _____.

Select the correct option which correctly fills the two blanks.

	(i)	(ii)
(a)	Thylakoid	PS II
(b)	Chloroplast	PS I
(c)	Thylakoid	PS I
(d)	Chloroplast	PS II

15. Match column I with column II and select the correct option.

	Column I		Column II
A.	Plasmotomy	(i)	Yeast
B.	Morphallaxis	(ii)	*Pelomyxa*
C.	Torulation	(iii)	*Agave*
D.	Vivipary	(iv)	Sponge

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

16. The thylakoids of chloroplast are removed and kept in a culture medium containing carbon dioxide and water. If the set up is exposed to light, hexose sugars are not formed as end products. The most appropriate reason for this is that
(a) carbon assimilation cannot take place in the presence of light
(b) the pigment systems are not working
(c) the enzymes are not available
(d) the light trapping device is non-functional.

17. Excessive growth of hair on the pinna is a feature found only in males because
(a) testosterone produced by males regulate this character
(b) the gene responsible for the character is present on the Y-chromosome only
(c) the gene responsible for the character is recessive in females
(d) females are only the carrier of this character.

18. What does the following cross represents?

AA × BB
↓
F_1
↓ Doubling
AAAABB

(a) Autopolyploidy (b) Allopolyploidy
(c) Autoallopolyploidy (d) Spontaneous mutation

19. Match the organisms given in column I with their common names in column II and choose the correct option.

	Column I		Column II
A.	*Chondrus*	(i)	Peat moss
B.	*Sphagnum*	(ii)	Spike moss
C.	*Cladonia*	(iii)	Irish moss
D.	*Selaginella*	(iv)	Reindeer moss

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

20. Pick out the wrong statements.
(i) The stamens in the Family Cucurbitaceae are synandrous, extrose and monothecous.
(ii) The entire shoot is modified for assimilatory function in cladodes.
(iii) Adventitious roots of *Pandanus* is an example of clinging roots.
(iv) Meristematic tissue is a group of thin-walled isodiametric cells which are capable of cell division.
(a) (i) and (ii) only (b) (iii) and (iv) only
(c) (ii) and (iii) only (d) (i) and (iv) only

21. A trisaccharide reducing sugar is
(a) sucrose (b) raffinose
(c) glucose (d) trehalose.

22. Which of the following is correctly matched in the given table?

	A	B	C
(a)	*Obelia*	Diploblastic	Biradial symmetry
(b)	*Palaemon*	Pseudocoelomate	Book gills
(c)	*Chimaera*	Cartilaginous fish	10 pairs of cranial nerves
(d)	*Neopilina*	Acoelomate	Connecting link

23. Choose the correct statements.

I. Dedifferentiated cells are differentiated cells which revert to undifferentiated state to take over the function of division.

II. In gram –ve bacteria, murein content is 30-40%.

III. The ratio of A + T/G + C in eukaryotic cell is <1.

IV. Cell wall prevents bursting of plant cells by inhibiting excessive endosmosis.

(a) I and IV (b) II, III and IV
(c) I and III (d) I, III and IV

24. Order of toxicity among nitrogenous waste products from higher to lower is

(a) uric acid < urea < ammonia
(b) uric acid < ammonia < urea
(c) urea < uric acid < ammonia
(d) ammonia > urea > uric acid.

25. Which of the following is correctly matched pair?

(a) Trochlear nerve –Thinnest and smallest cranial nerve
(b) Parasympathetic neural system – Relaxes gall bladder
(c) Sciatica – Disturbance in peripheral neural system
(d) Pseudounipolar neuron – Embryonic stage

26. Which of the following statements is correct?

(a) Relaxin hormone is secreted by follicular cells.
(b) During spermatogenesis, type A spermatogonia are the precursors of sperms.
(c) Menstrual phase is caused by increase in progesterone and oestrogen.
(d) Placental hormone hCS stimulates the growth of mammary glands during pregnancy.

27. Sexually transmitted disease which causes arthritis and eye infection in children of affected mother is

(a) syphilis (b) chlamydiasis
(c) gonorrhoea (d) chancroid.

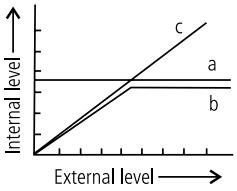
28. Study the given table.

	Biomagnification	Eutrophication
(i)	It is the increase in concentration of non-biodegradable substance in the food chain.	It is the enrichment of the water body with plant nutrients.
(ii)	It is found in aquatic ecosystem only.	It is found in oceans only.
(iii)	It does not result in organic loading.	It leads to organic loading.
(iv)	It leads to toxicity in higher order consumers.	It leads to toxicity in low order consumers.

On the above given differences.

(a) (i) and (ii) alone are correct
(b) (i) and (iii) alone are correct
(c) (ii) and (iv) alone are correct
(d) (i), (iii) and (iv) alone are correct.

29. Which of the following statements is incorrect?



(a) Birds and mammals belong to category 'a'.
(b) Animals in category 'b' always maintain constant internal environment.
(c) Osmotic concentration of animals in category 'c' changes according to ambient conditions.
(d) Animals of category 'a' shows suspended development during unfavourable conditions.

30. Substrates used in floating respiration are

(a) proteins only
(b) fats and proteins
(c) carbohydrates and fats
(d) carbohydrates only.

31. The stock is given a V-shaped notch and the scion is given a wedge-like cut of same diameter in

(a) crown grafting (b) side grafting
(c) approach grafting (d) wedge grafting.

32. Match the terms in column I with their description in column II and choose the correct option.

	Column I		Column II
A.	Allochronic species	(i)	Morphologically similar species which donot interbreed.
B.	Polytypic species	(ii)	Species of different period of time.
C.	Sibling species	(iii)	Species developed and occurring in an exclusive geographical area.
D.	Allopatric species	(iv)	Species having two or more varieties or subspecies.

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

33. Which of the following statements is incorrect?

(a) Pluripotency is the ability of a cell to develop any type of the cell in the animal body.
(b) A gene bank is repository of clones of unknown DNA fragments, genes and gene maps.
(c) An auxotroph is a mutant incapable to prepare its own metabolites.
(d) An intron consists of non-coding region of cistron.

34. The bacteria that destroys penicillin is

(a) *Spirochaete cytophaga*
(b) *Desulfovibrio desulfuricans*
(c) *Bacillus brevis*
(d) *Staphylococcus aureus.*

35. Bicarpellary syncarpous gynoecium is not found in the flowers of
(a) *Atropa belladona* (b) *Solanum nigrum*
(c) *Cestrum nocturnum* (d) *Colchicum autumnale*.

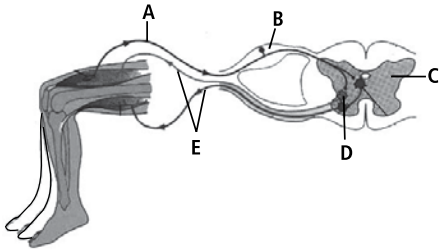
36. Select the incorrect statement among the following given statements.
(a) Prostaglandins are derivatives of arachidonic acid.
(b) Cysteine is a sulphur containing amino acid.
(c) van der Waals interactions form by sharing of proton by two electronegative atoms.
(d) Guanine is a large-sized nitrogen containing molecules.

37. In which of the following organisms' skull have one occipital condyle?
(a) *Columba* (b) *Salamandra*
(c) *Rhacophorus* (d) *Macropus*

38. _____coagulates blood by hydrolysing fibrinogen to fibrin.
(a) Hirudin (b) Oxalate
(c) Trypsin (d) Citrate

39. Site of absorption of monosaccharides, amino acids, fatty acids, glycerol and vitamins is
(a) stomach (b) duodenum
(c) jejunum (d) ileum.

40. Identify the parts labelled as A to E and choose the correct option for given diagrammatic representation of knee jerk reflex.



(a) A-Afferent pathway, B-Dorsal root ganglion, C-White matter, D-Motor neuron, E-Efferent pathway
(b) A-Afferent pathway, B-Dorsal root ganglion, C-Gray matter, D-Motor neuron, E-Efferent pathway
(c) A-Efferent pathway, B-Sensory neuron, C-Gray matter, D-Motor neuron, E-Afferent pathway
(d) A-Afferent pathway, B-Ventral root ganglion, C-White matter, D-Interneuron, E-Efferent pathway.

41. Match the following columns.

Column I	Column II
A. Calcitonin	1. Gonadotropin
B. Aldosterone	2. Growth inhibiting hormone
C. Luteinising hormone	3. Thyroid hormone
D. Somatostatin	4. Salt retaining hormone
	5. Regulates blood calcium level.
	6. Controls ovulation
	7. Hypothalamus
	8. Mineralocorticoid

(a) A-3, 5; B-4, 8; C-1,6; D-2, 7
(b) A-3, 5; B-4, 6; C-2,8; D-1, 7
(c) A-4, 7; B-3, 6; C-2,5; D-1, 8
(d) A-1, 5; B-2, 6; C-3,8; D-4, 7

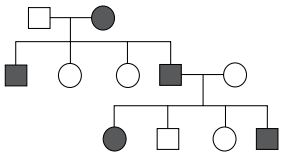
42. Identify the incorrectly matched pair.
(a) Pneumonia – Mucus collects in alveoli
(b) Diphtheria – Diagnosed by dick test
(c) Koch's disease – Treated by streptomycin and rifampicin drugs
(d) Chlamydia – Intracellular parasites

43. Which of the following cloning vector can be used for cloning DNA fragments upto 45 Kb in length?
(a) Cosmids (b) BAC
(c) Phagemids (d) YAC

44. Spindle of plant cell is called
(a) amphiaster (b) anastral
(c) acentric (d) both (b) and (c).

45. The electrochemical potential gradient created across the membrane of mitochondria due to high H^+ concentration on one side is called
(a) proton gradient (b) proton motive force
(c) electron gradient (d) none of these.

46. Study the given pedigree carefully and select the correct option regarding it.



The given pedigree shows
(a) inheritance of sex-linked inborn error of metabolism like phenylketonuria
(b) criss-cross inheritance of sex-linked character like haemophilia
(c) inheritance of a condition like Alzheimer's disease as an autosomal dominant genes
(d) inheritance of autosomal recessive genetic disorder like Gaucher's disease.

47. Which of the following statements is wrong?
(a) In *Pinus*, male gametophyte is free-living.
(b) The sporophyte of *Polytrichum* is more developed than that in *Riccia.*
(c) *Wolffia* is the smallest known angiosperm.
(d) *Salvinia* is a heterosporous pteridophyte.

48. Select the option which clearly differentiates phellem from phelloderm.

	Phellem	Phelloderm
(a)	It is formed on the innerside of phellogen	It is formed on the outerside of phellogen
(b)	It is made up of living cells	It is made up of dead cells
(c)	Its cells store the food	It is protective in function
(d)	Suberisation is present	Suberisation is absent

49. Read the differences between chlorophyll ***a*** and chlorophyll ***b***.

	Chlorophyll *a*	Chlorophyll *b*
1.	Its formula is $C_{55}H_{72}O_5N_4Mg$.	Its formula is $C_{55}H_{70}O_6N_4Mg$.
2.	It is an accessory photosynthetic pigment.	It is a primary photosynthetic pigment.
3.	Carbon-3 contains aldehyde (–CHO) group.	Carbon-3 contains methyl ($-CH_3$) group.
4.	It is soluble in petroleum ether.	It is soluble in 92% methyl alcohol.

Of the above differences
(a) Only 1 and 2 are correct
(b) Only 3 and 4 are correct
(c) Only 1 and 4 are correct
(d) Only 2 and 3 are correct.

50. In amphibians, P receives oxygenated blood from gills and Q receives deoxygenated blood from body parts. Both oxygenated and deoxygenated blood get mixed in R which pumps out mixed blood. This is called S circulation.
(a) P-left atrium, Q-right atrium, R-single ventricle, S-incomplete
(b) P-left atrium, Q-right ventricle, R-right atrium, S-single
(c) P-right atrium, Q-left atrium, R-single ventricle, S-systemic
(d) P-left ventricle, Q-right atrium, R-left atrium, S-pulmonary.

51. In human eye, canal of schlemm is present
(a) at junction of choroid and sclera
(b) in external plexiform layer
(c) in pigment cell layer
(d) at the junction of sclera and cornea.

52. Identify the correct sequence of various steps involved in MOET.
(i) Cow produces 6-8 eggs.
(ii) Cow is artificially inseminated.
(iii) Cow is administered with FSH like hormone.
(iv) Embryos at 8-32 celled stage are collected and transferred to surrogate mothers.
(a) (iii) → (ii) → (i) → (iv)
(b) (iii) → (i) → (ii) → (iv)
(c) (i) → (iii) → (ii) → (iv)
(d) (ii) → (iii) → (i) → (iv)

53. A stage of hydrosere in which *Hydrilla* and *Potamogeton* are found.
(a) Submerged stage (b) Floating stage
(c) Reed swamp stage (d) Marsh meadow stage

54. An excised anther gave rise to a few haploid and a few diploid plants, in a tissue culture medium. The diploid plants did not show homozygosity. These diploid plants might have developed from
(a) microspores and wall layer cells
(b) wall layer cells only
(c) microspore mother cells and wall layer cells
(d) microspore mother cells, microspores and wall layer cells.

55. The double stranded DNA has 15% of cytosine. The percentage of adenine in DNA will be
(a) 35% (b) 30%
(c) 45% (d) 70%.

56. Read the given statements.
(i) A clone is a group of genetically identical individuals and is always developed through sexual reproduction.
(ii) Papaya and date palm are dioecious plants.
(iii) Vegetative cells in pollen grain of angiosperms are represented by prothallial cells.
(iv) The carpel is homologous to megasporangium.
(v) Interspecific incompatibility prevents free cross pollination amongst members of different species.
Among the given statements.
(a) (i), (ii) and (iii) are correct
(b) (ii), (iii) and (iv) are correct
(c) (ii), (iii), (iv) and (v) are correct
(d) (ii), (iii) and (v) are correct.

57. Which type of population and age pyramid are represented by population having equal number of prereproductive and reproductive individuals and fewer post reproductive individuals?
(a) Stable population with triangular age pyramid
(b) Stable population with bell shaped age pyramid
(c) Increasing population with bell shaped age pyramid
(d) Diminishing population with urn shaped age pyramid

58. Fertilisation does not occur in absence of Ca^{2+} because
(a) Ca^{2+} is required for acrosomal reaction
(b) Ca^{2+} is essential for ovulation
(c) Ca^{2+} increase sperm motility and viability
(d) Ca^{2+} helps in spermiation.

59. Read the given statements and select the correct option.
Statement A : *Lacerta saxicola armaniaca* does not show biparental sexual reproduction.
Statement B : *Lacerta saxicola armaniaca* reproduces exclusively by parthenogenesis.
(a) Both statements A and B are correct and statement B is the correct explanation of statement A.
(b) Both statements A and B are correct but statement B is not the correct explanation of statement A.
(c) Statement A is correct but statement B is incorrect.
(d) Both statements A and B are incorrect.

60. Match the columns.

	Column I		Column II		Column III
I.	Argentaffin cells	p.	Castle intrinsic factor	(i)	Vasoconstrictor
II.	Liver	q.	Serotonin	(ii)	Protein digestion
III.	Brunner's glands	r.	Angiotensinogen	(iii)	Vit. B_{12} absorption
IV.	Parietal cells	s.	Enterokinase	(iv)	Osmoregulation

(a) I-q-(ii), II-r-(iv), III-p-(i), IV-s-(iii)
(b) I-q-(i), II-r-(iv), III-s-(ii), IV-p-(iii)
(c) I-r-(i), II-s-(iv), III-p-(ii), IV-q-(iii)
(d) I-p-(ii), II-q-(iii), III-r-(i), IV-s-(iv)

61. Read the given statements (A-D) and select the option which correctly identifies the given statements.
A. A molecule which can move freely across the semi-permeable membrane of plant cells.
B. An enzyme known for starch-glucose interconversion during the opening and closing of stomata.
C. The tissue through which the ascent of sap takes place.
D. A substance that causes partial closing of the stomata.

	A	B	C	D
(a)	Water molecule	Amylase	Xylem	Phenyl mercuric acetate
(b)	Water molecule	Amylase	Phloem	Mercury
(c)	Lipid molecule	Hexokinase	Xylem	Mercury
(d)	Lipid molecule	Hexokinase	Phloem	Phenyl mercuric acetate

62. Scouring rush is used for scouring pots, pans and floors because
(a) it serves as a disinfectant
(b) it contains silica in its epidermal cell wall
(c) it is easily available
(d) it contains gold in its epidermal cell wall.

63. *Triticum* is known as festucoid grass because
(a) vascular bundle is surrounded by single sheath of compactly arranged parenchyma cells
(b) vascular bundle is chlorenchymatous
(c) vascular bundle is sclerenchymatous
(d) vascular bundle is surrounded by double sheath of compactly arranged parenchyma cells.

64. During movement of fresh air into lungs
(a) external intercostal muscles contracts
(b) diaphragm relaxes and becomes dome shaped
(c) abdominal muscles contracts
(d) both (a) and (c).

65. Most abundant mineral element in muscles is
(a) calcium (b) potassium
(c) phosphorus (d) magnesium.

66. Lysozyme is not present in
(a) saliva (b) tears
(c) tissue fluid (d) sweat.

67. Warm blooded animals of colder areas have large body size compared to animals of warmer areas. This is
(a) Allen's rule (b) Gloger's rule
(c) Bergamann's rule (d) Jordan's rule

68. Which of the following hormones is used to prevent the sprouting of potatoes?
(a) 2-4-dichlorophenoxy acetic acid
(b) 2,4,5-trichlorophenoxy acetic acid
(c) Indole-3-Acetic acid
(d) 2-methyl-4-chlorophenoxy acetic acid

69. In polygenic inheritance, the parents show two distinct characters but the F_1 generation shows intermediate characters because of
(a) excess of recessive gene
(b) dilution of dominant gene
(c) dilution of recessive gene
(d) excess of dominant gene.

70. The chemiosmotic coupling hypothesis of oxidative phosphorylation proposes that adenosine triphosphate (ATP) is formed because
(a) a proton gradient forms across the inner membrane
(b) there is a change in the permeability of the inner mitochondrial membrane toward adenosine diphosphate (ADP)
(c) high energy bonds are formed in mitochondrial proteins
(d) ADP is pumped out of the matrix into the intermembrane space.

71. Chilled ethanol is added during DNA isolation because
(a) it breaks open the cell to release DNA
(b) it is used to remove RNA and proteins
(c) it precipitates purified DNA
(d) it stabilises single stranded DNA.

72. Which nerve is known as nerve of micturition?
(a) Parasympathetic (b) Sympathetic
(c) Vagus (d) Pudendal

73. Nodule formation in roots of leguminous plants is stimulated by _____ produced by cortical cells and _____ liberated by invading bacteria.
(a) cytokinin, gibberellin (b) auxin, cytokinin
(c) auxin, ethylene (d) gibberellin, ethylene

74. The oldest layer of secondary phloem in a dicotyledonous stem is located
(a) inside the epidermis
(b) outside the vascular cambium
(c) inside the primary cortex
(d) inside the vascular cambium.

75. Select the incorrect statement from the following.
(a) Water is absorbed by a system having DPD = 10 atm from another system having DPD = 5 atm.
(b) The values of turgor pressure and solute potential are in case of fully turgid cell.
(c) DPD becomes 0 in case of a flaccid cell.
(d) Osmotic potential is the reduction in free energy of water due to decrease in number of water molecules per molal volume.

76. In female cockroach, each ovary consists of (i) ovarioles. On an average, a female produces (ii) ootheca. Each ootheca contains (iii) fertilised eggs. (iii) nymphs develops in one ootheca. The nymph shows (iv) metamorphosis.

	(i)	(ii)	(iii)	(iv)
(a)	2	100-200	10-15	ametabolous
(b)	6	5-10	12-15	holometabolous
(c)	8	9-10	14-16	paurometabolous
(d)	12	12-15	9-10	hemimetabolous

77. Which of the following statements is incorrect?
(a) Urine of a normal individual does not contain glucose.
(b) Sweat does not contain uric acid.
(c) Sebum removes fatty acids from the body.
(d) A normal adult secretes about 3.5-4 litres of urine in 24 hours.

78. Prebiotics are
(a) non-digestible food ingredients that stimulate the growth of bacteria in the digestive tract
(b) live microorganisms taken as healthy drink to provide useful bacteria to the body
(c) species specific narrow spectrum biocontrol agents
(d) both (a) and (b).

79. Which of the following pairs is incorrectly matched?
(a) Kinetin – adenine derivative
(b) Gibberellin – terpenes
(c) Ethylene – gases
(d) ABA – indole compounds

80. Flowers of *Kigelia pinnata* have abundant nectar and prominent stamens. They are pollinated by
(a) insects (b) winds
(c) birds (d) bats.

81. Darwin's finches are an example of
(a) adaptive radiation
(b) restricted distribution
(c) convergent evolution
(d) discontinuous distribution of closely related species.

82. Which of the following is correctly matched?
(a) Methyl isocyanate – Mottling of teeth
(b) Sulphur oxides – Brown air
(c) Flyash – Clogging of stomata
(d) Carbon monoxide – Photochemical smog

83. Arabanoxylan is a heteropolysaccharide made up of
(a) different types of monosaccharides
(b) different types of disaccharides
(c) similar types of monosaccharides
(d) one monosaccharide and one disaccharide.

84. Fangs in snakes are modified
(a) salivary glands (b) poison glands
(c) mandibles (d) maxillary teeth.

85. Which of the following statements is incorrect?
(a) The intestinal mucosa has brush-bordered absorptive columnar epithelium.
(b) Mammary glands are merocrine glands, which accumulate secretory products in apical part.
(c) Tendons which connect muscles with bones are white fibrous connective tissues.
(d) Eustachian tube is lined with ciliated columnar epithelium.

86. Lungs contain about 2100 ml or air after a normal expiration. If residual volume of lungs is about 1100 ml, then amount of air that can be expired forcibly after normal expiration is
(a) 3200 ml (b) 1100 ml
(c) 1000 ml (d) none of these.

87. Read the given statements and select the correct option.
Statement A : During external respiration, oxygen passes from alveoli into the blood.
Statement B : pO_2 in alveolar air is 104 mmHg while pO_2 in deoxygenated blood is 40mmHg.
(a) Both statements A and B are correct and statement B is the correct explanation of statement A.
(b) Both statements A and B are correct but statement B is not the correct explanation of statement A.
(c) Statement A is correct but statement B is incorrect.
(d) Both statements A and B are incorrect.

88. Multiload 375 helps in contraception as
(a) it suppress sperm motility and fertilising capacity of the sperms.
(b) it increases phagocytosis of sperms within uterus
(c) it makes uterus unsuitable for implantation
(d) it impairs ability of cervix to allow passage and transport of sperms.

89. If the night period in a long-day plant is interrupted by a brief exposure to light,
(a) the plant fails to flower
(b) the flowering of the plant will be enhanced
(c) the flowering response will remain uneffected
(d) the growth of plant will be affected negatively.

90. *Rauwolfia vomitaria* growing in different ranges of Himalaya shows difference in the potency and concentration of active chemical reserpine due to
(a) species diversity (b) beta diversity
(c) gamma diversity (d) genetic diversity.

ANSWER KEY

1.	(b)	**2.**	(b)	**3.**	(a)	**4.**	(a)	**5.**	(d)
6.	(d)	**7.**	(b)	**8.**	(d)	**9.**	(d)	**10.**	(c)
11.	(d)	**12.**	(b)	**13.**	(b)	**14.**	(a)	**15.**	(b)
16.	(c)	**17.**	(b)	**18.**	(c)	**19.**	(a)	**20.**	(c)
21.	(b)	**22.**	(c)	**23.**	(a)	**24.**	(d)	**25.**	(a)
26.	(d)	**27.**	(c)	**28.**	(b)	**29.**	(b)	**30.**	(c)
31.	(d)	**32.**	(b)	**33.**	(b)	**34.**	(c)	**35.**	(d)
36.	(c)	**37.**	(a)	**38.**	(c)	**39.**	(c)	**40.**	(b)
41.	(a)	**42.**	(b)	**43.**	(a)	**44.**	(d)	**45.**	(b)
46.	(b)	**47.**	(a)	**48.**	(d)	**49.**	(c)	**50.**	(a)
51.	(d)	**52.**	(b)	**53.**	(a)	**54.**	(c)	**55.**	(a)
56.	(d)	**57.**	(b)	**58.**	(a)	**59.**	(b)	**60.**	(b)
61.	(a)	**62.**	(b)	**63.**	(c)	**64.**	(a)	**65.**	(b)
66.	(d)	**67.**	(c)	**68.**	(d)	**69.**	(b)	**70.**	(a)
71.	(c)	**72.**	(a)	**73.**	(b)	**74.**	(c)	**75.**	(c)
76.	(c)	**77.**	(d)	**78.**	(a)	**79.**	(d)	**80.**	(d)
81.	(a)	**82.**	(c)	**83.**	(a)	**84.**	(d)	**85.**	(b)
86.	(c)	**87.**	(a)	**88.**	(a)	**89.**	(b)	**90.**	(d)

HIGH YIELD FACTS

Class XII

Reproductive Health

- According to World Health Organisation (WHO), reproductive health means a **total well being in physical, emotional, behavioural and social aspects of reproduction.**
- Problems of reproductive health include birth defects, low birth weight, preterm birth, reduced fertility, impotency and menstrual disorders.

REPRODUCTIVE HEALTH - PROBLEMS AND STRATEGIES

- India was among the first countries in the world that initiated action plans and programmes at a national level to attain total reproductive health as a social goal.
- These programmes called **'family planning'** were initiated in 1951 and were periodically assessed over the past decades.
- Improved programmes covering wider reproduction-related areas are currently in operation under the popular name **'Reproductive and Child Health Care (RCH) programmes'.**
- Creating awareness among people about various reproduction related aspects and providing facilities and support for building up a reproductively healthy society are the major tasks under these programmes.
- Proper information about reproductive organs, changes encountered during adolescence, safe and hygienic sexual practices, sexually transmitted diseases (STDs), etc., would help individuals to lead a healthy reproductive life.
- Fertile couples and people of marriageable age group should know about available birth control devices, care of pregnant mothers, postnatal (after birth) care of the mother and child, importance of breast feeding, equal importance of the male and female child, etc.
- Audio-visual and print media, governmental and non-governmental agencies are doing good job to create awareness among people about reproduction in humans.
- Parents, close relatives, friends and teachers also have a major role in providing the information regarding reproductive health.

Analysis of various PMTs from 2012-2016

	2012	2013	2014	2015	2016
AIPMT/NEET	2	2	3	1	2
AIIMS	–	1	–	–	–
AMU	2	2	1	–	–
Kerala	1	–	–	1	2
K.CET	1	4	1	2	2
J & K	1	–	1	–	–

- **Sex education** in schools is being introduced and encouraged to provide right information about myths and misconceptions about sex-related aspects.
- Awareness of problems due to uncontrolled population growth, social evils like sex abuse and sex-related crimes, etc., should be created so that people should think and take up necessary steps to prevent them and thereby build up a reproductively healthy society.
- A successful action plan to attain reproductive health, requires good infrastructural facilities, professional expert knowledge and material support.
- Research should be encouraged and supported to find out new methods of birth control.
- Statutory ban on use of **amniocentesis** for sex-determination to legally check increasing female foeticides; and massive child immunisation, etc., are some appreciable steps taken by government to ensure reproductive health of society.
- **Maternal and Child Health (MCH) Services** and family planning is one of the important programmes of health care centres.

UNIVERSAL IMMUNISATION PROGRAMME

The Universal Immunisation Programme of India was launched in 1985. It comprises of those vaccines that are given free of cost to all children of the countries. The National Immunisation schedule is given in the following table.

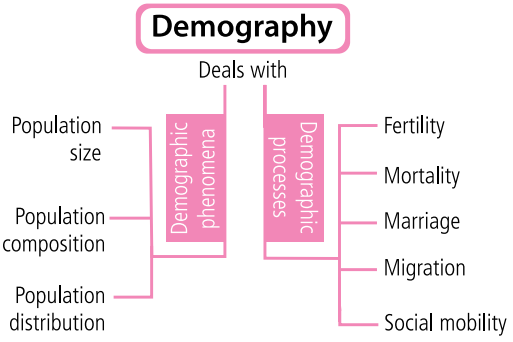
Table : National Immunisation Schedule

Age	Vaccine
Birth	BCG, (Bacillus Calmette Guerin) OPV_0 (Oral Polio Vaccine)
6 weeks	DPT - 1st dose (Diptheria, pertussis, tetanus) OPV - 1st dose accine) *Hib - 1st dose (Hemophilus influenzae type 'b' vaccine) BCG-(if not given at birth)
10 weeks	DPT - 2nd dose OPV - 2nd dose Hep B - 2nd dose Hib - 2nd dose
14 weeks	DPT - 3rd dose OPV - 3rd dose Hep B - 3rd dose Hib - 3rd dose
9-12 months	Measles vaccine
16-24 months	DPT - 1st Booster OPV - 4th dose **MMR (Measles, Mumps, Rubella vaccine)
5-6 years	DPT
10 years	TT (Tetanus toxoid)
16 years	TT
Pregnant women	TT-1st dose (early in pregnancy) TT-2nd dose (1 month later) TT-Booster (If vaccindated in past 3 years)
9, 18, 24, 30 and 36 months	Vitamin A

Source : IAP Guide Book on Immunization
* Hib is being introduced in two states to begin with
** MMR is available in some states only

POPULATION EXPLOSION

- Population is defined as the total number of individuals of a species present in a particular area at a given time.
- Scientific study of human population is called **demography**.



- Human population is increasing at a rate of over two persons every second or about 2,00,000 people everyday.

Such a rapid or exponential increase in population is termed as **population explosion**.

- In the last century, an all-round development in various fields significantly improved the quality of life of the people.
- However, increased health facilities along with better living conditions had an explosive impact on the growth of population.
- The world population which was around 2 billion in 1900, rocketed to about 6 billion by year 2000.
- A similar trend was observed in India too. Our population which was approximately 350 million at the time of our independence, crossed 1 billion in May, 2000.
- Presently in 2016, the population of India is reported as 1.32 billion (May 15, 2016), second to China with 1.41 billion people.
- The figures show that India represents almost 17.85% of the world's population, which means one out of six people on this planet live in India.
- With the population growth rate at 1.2%, India is predicted to have more than 1.53 billion people by the end of 2030.

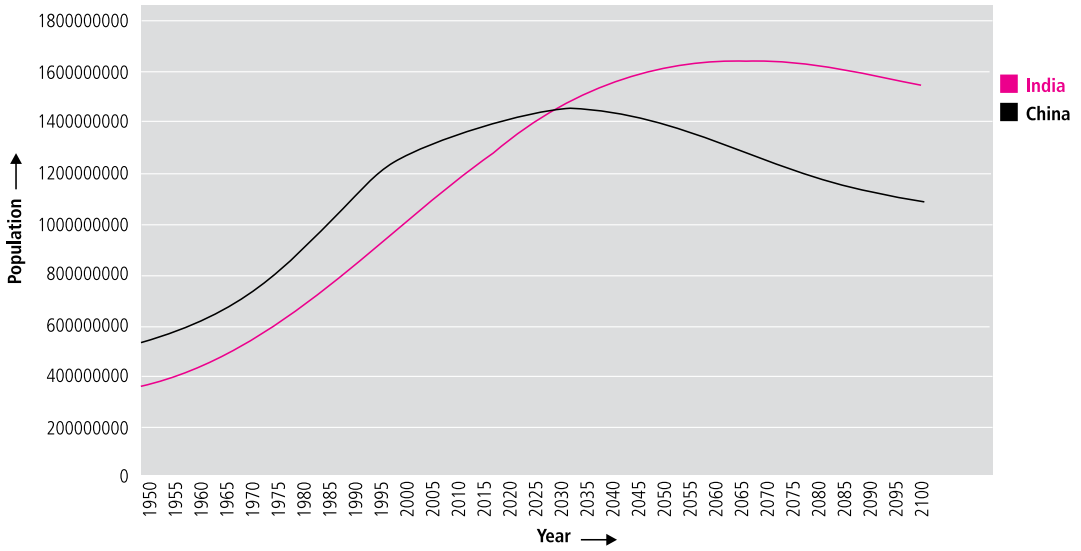


Fig.: India and China population projection

Reasons for population explosion

- Early marriage
- Religious orthodoxy against family planning
- Increased health facilities
- Better food storage and transportation facilities
- Increased sanitation and life amenities
- Reduced death rate, particularly IMR and MMR
- Desire for male child
- Increased agricultural production
- Lack of social awareness
- Advanced postnatal care
- Better means of protection from natural calamities

Recent Facts and figures (2016)

- Population of India - 1.32 billion (May 15, 2016)
- Literacy rate in India - 75.04%
- Population density - 446/km^2
- Sex ratio - 944

Table : Statewise figures (2011 census)

Attribute		State	Union Territory
Population size	Highest	Uttar Pradesh	NCT of Delhi
	Lowest	Sikkim	Lakshadweep
Population density (number of persons/Km^2)	Highest	Bihar (1106)	NCT of Delhi (11,320)
	Lowest	Arunachal Pradesh(17)	Andaman and Nicobar islands (46)
Literacy rate	Highest	Kerala (93.91%)	Lakshadweep (91.85%)
	Lowest	Bihar (63.82%)	Dadra and Nagar Haveli (77.65%)
Sex ratio (number of females per 1000 males)	Highest	Kerala (1,084)	Puducherry (1,037)
	Lowest	Haryana (877)	Daman and Diu (618)

*The state government of, Tripura claimed that the state has achieved first position in literacy rate with 94.65% beating Kerala in 2013

Consequences of population explosion

- Over population leads to a number of not only national but also individual family problems. Some of them are described below :
  - It increases poverty in the family as well as in the country.
  - If the production of food does not increase it will lead to a shortage of food supply, as a result children (especially) will suffer from malnutrition.
  - It leads to unemployment and educational problems.
  - It is very difficult to provide house to everyone in case of rapid increase in population.
  - Over population causes eco-degradation in more than one way, such as rise in pollution, unhygienic condition and deforestation, etc.
  - It leads to shortage of essential goods thereby resulting in hike in their prices.
  - Increase in population has created energy crisis. The demand for fuelwood, oil, gas, coal and electricity is increasing.
  - It has been observed in nature that an exponentially or rapidly growing population soon reaches a stage with limited supply of nutrients and other resources. After it, population either stabilises or shows declined growth rate. Malthus theory describes the same thing. **Thus, overpopulation must be checked to maintain continuity of human race.**

Malthus theory of human population growth

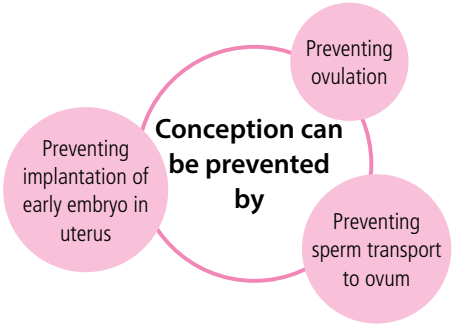
- In 1798, **T.R. Malthus**, a British economist, put forward a theory of human population growth.
- He stated that population grows geometrically (1, 2, 4, 8, 16, 32 ...) when unchecked, whereas the means of its subsistence, like food, grow only arithmetically (1, 2, 3, 4, 5, 6, 7 ...).
- Naturally, after some time an imbalance would occur in the population and the environment.
- When the imbalance reaches a certain value, some factors like hunger, epidemics, floods, earthquakes, war, etc., will bring the population to a desired level. Such a population "crash" is called **catastrophic control of population**. These factors were called "positive checks" by Malthus.

Measures to control population

- Reduction in birth rate is the only practicable and direct method to control world's population. It can be done in following ways:
  - People, particularly those in the reproductive age group, should be educated about the advantages of small family. Various media may be used for this purpose ***e.g.***, posters showing a happy couple with two children with a slogan "**Hum Do Humare Do**" should be displayed.
  - At present, marriageable age is 18 years for girls and 21 years for boys. By increasing the age of marriage, population growth can be checked.
  - Couples with small families can be encouraged by giving incentives.
  - Use of birth control measures must be encouraged to check birth rate.

BIRTH CONTROL (CONTRACEPTION)

- The regulation of conception by preventive methods or devices to limit the number of offsprings is called **birth control** or **contraception.** They basically prevent fertilisation.
- An ideal contraceptive should be user-friendly, easily available, effective and with least or no side effects. It also should not interfere with the sexual drive.
- Various contraceptive methods are available which could be broadly grouped into the following categories : temporary and permanent methods. Somehow, if contraceptives fail, abortive measures are used.



Temporary methods

- These methods prevent conception only for a limited period. Their regular use is necessary for continued avoidance of pregnancy. They include:
  - Natural/ traditional methods
  - Barrier methods
  - Chemical methods
  - IUCDs (Intrauterine Contraceptive Devices)
  - Oral contraceptive pills
  - Subcutaneous implants
  - Morning after pills
  - Hormone injections

Natural methods

- Natural methods work on the principle of avoiding meeting of ovum and sperms *i.e.*, fertilisation, without using any physical or chemical aid.

Natural methods

Periodic abstinence or rhythm method

- The couples avoid or abstain from coitus (copulation or intercourse) from day 10 to 17 of the menstrual cycle because ovulation can occur during this period.
- This is called fertile period as chances of fertilisation are very high during this period.
- The effectiveness of this method is limited because only a few women have regular menstrual cycles and the actual time of ovulation cannot be predicted.

Coitus interruptus or withdrawal method

- It involves withdrawal of the penis from the vagina by the male just before ejaculation, so that semen is not deposited in the vagina and thus fertilisation cannot take place.
- This method is only moderately effective because male produces some lubricating fluid before ejaculation that contains many sperms.

Lactational amenorrhea method

- It is based on the fact that ovulation and therefore the menstrual cycle does not occur during the period of intense lactation following child birth (parturition).
- This method is considered effective only upto a maximum period of six months following parturition.

- Periodic abstinence method is based on these facts: (a) Ovulation occurs on 14th day of menstruation. (b) Ovum remains alive for about 1-2 days. (c) Sperms remain viable for about 3 days.

Barrier methods

- In barrier methods, ovum and sperm do not meet due to physical barriers and hence, fertilisation does not occur. These methods are available for both males and females.

Condoms

- They are barriers made of thin rubber/latex sheath used to cover the penis in male or vagina and cervix in female just before coitus so that the ejaculated semen is not released in the female reproductive tract and hence prevent fertilisation.
- It is most widely used contraceptive by males in India as it is cheap and easily available. Female condoms are called **femidoms.**
- Condom should be discarded after a single use. Condom is also a safeguard against AIDS and other sexual diseases.

Barrier methods

Diaphragms, Cervical caps and Vault Caps

- They are also made of rubber and are inserted into the female reproductive tract to cover the cervix before coitus.
- They prevent fertilisation by blocking entry of sperms through cervix.
- These barriers are reusable. Spermicidal jellies, creams and foams are generally used alongwith these barriers to increase their efficiency.

Diaphragm

- Soft rubber cup that covers entrance to uterus. It prevents a sperm from reaching an egg; and holds spermicide.
- It provides some protection against sexually transmitted diseases and cervical cancer.

Cervical cap

- It is a miniature diaphragm that covers cervix closely.
- It prevents a sperm from reaching an egg and holds spermicide.

Vault cap

- It is hemispheric dome like rubber or plastic cap with a thick rim which is meant for fitting over the vaginal vault over the cervix.

Chemical methods

- In these methods foam tablets, creams, jellies and pastes are inserted in the vagina before intercourse to prevent sperms from entering the uterus.

Chemical methods

These contain **spermicides** (kill spermatozoa) such as lactic acid, citric acid, boric acid, zinc sulphate and potassium permanganate which kill sperms.

Sponge ('Today') is a foam suppository or tablet containing nonoxynol as spermicide.

'**Delfen**' is available as cream.

Contd. on page no. 63

PMT FOUNDATION

Class-11

Maximise your chance of success in Medical Entrance Exams by reading this column. This section is specially designed to optimise your preparation by practising more and more. It is a unitwise series having chapterwise question bank, allowing you to prepare systematically and become more competent.

- Recall question or single concept question – indicated by a single finger.
- Application question or question which requires 2 or 3 concepts to solve - indicated by 2 fingers.
- Application question or question which requires 3 or more concepts - indicated by 3 fingers.

UNIT-I : DIVERSITY IN THE LIVING WORLD

CHAPTER-1 : THE LIVING WORLD

Multiple Choice Questions

1. Taxonomic hierarchy refers to
(a) step-wise arrangement of all categories for classification of plants and animals
(b) a group of senior taxonomists who decide the nomenclature of plants and animals
(c) a list of botanists or zoologists who have worked on taxonomy of a species or group
(d) classification of a species based on fossil record.

2. The living organisms can be unexceptionally distinguished from the non-living things on the basis of their ability for
(a) interaction with the environment and progressive evolution
(b) reproduction
(c) growth and movement
(d) responsiveness to touch.

3. Herbarium sheets are arranged according to the system of classification and should have information about
(a) time and place of collection, English, local and botanical names, phylum, collector's name
(b) date and time of collection, English, local and botanical names, class, collector's name
(c) date and place of collection, English, local and botanical names, order, collector's name
(d) date and place of collection, English, local and botanical names, family, collector's name.

4. In fish, *Catla catla* the specific name is identical with the generic name, thus it is an example of
(a) autonym (b) tautonym
(c) synonym (d) homonym.

5. Who published the book "*Systema Naturae*"?
(a) Linnaeus (b) Aristotle
(c) Theophrastus (d) Hippocrates

6. Select the correct method of showing scientific name of wheat derived by binominal nomenclature.
(a) *Triticum Aestivum* (b) *triticum aestivum*
(c) *triticum Aestivum* (d) *Triticum aestivum*

7. Order is placed between
(a) Family and Genus (b) Class and Family
(c) Phylum and Class (d) Genus and Species.

8. Taxon represents
(a) group of living organisms with respect to their size
(b) group of living organisms with respect to their taxonomic rank
(c) group of living organisms irrespective of size or taxonomic rank
(d) none of these.

9. Biosystematics aims at
(a) the classification of organisms based on broad morphological characters
(b) delimiting various taxa of organisms and establishing their relationships

(c) the classification of organisms based on their evolutionary history and establishing their phylogeny on the totality of various parameters from all fields of studies
(d) identification and arrangement of organisms on the basis of their cytological characteristics.

10. The word species was introduced by
(a) Aristotle (b) Hippocrates
(c) John Ray (d) Engler.

True or False

11. Photoperiods influence reproduction in seasonal breeders.
12. Manual is treatise having all information about a particular taxon like family or genus.
13. All organisms have species as the highest category.
14. The keys are based on the contrasting characters generally in a pair called lead.
15. All the individuals of a species contain similar genetic material.
16. Key is an artificial analytic device having a list of statements with dichotomic table of alternate characteristics which is used for identifying organisms.
17. Growth occurs when catabolism exceeds anabolism.
18. Classical taxonomy studies primitiveness, advancements and inter-relationships of species.
19. The term new systematics was coined by Julian Huxley (1940).
20. Taxonomic studies consider a group of individual organisms with fundamental similarities as a genus.

Match The Columns

21. Match Column I with Column II.

Column I	Column II
A. Julian Huxley	(i) Father of Zoology
B. Linnaeus	(ii) New systematics
C. John Ray	(iii) Father of Botany
D. Theophrastus	(iv) Binomial nomenclature
E. Aristotle	(v) Introduced species

22. Match Column I with Column II. (There can be more than one match for items in Column I).

Column I	Column II
A. Obligate categories	(i) *Impatiens balsamifera*
B. Intermediate categories	(ii) Family
C. Touch me not	(iii) Tribe
D. *Solanaceae*	(iv) *Mimosa pudica*
E. Dodhak	(v) *Petunia*
	(vi) *Euphorbia*
	(vii) *Nicotiana*
	(viii) *Launae*a
	(ix) Species
	(x) Variety

Passage Based Questions

23.(A) Complete the given passage with appropriate words or phrases.

Metabolism is of two kinds, (i) and (ii) . (i) constitutes (iii) and is also known as (iv) metabolism because it involves breaking of complex substances into simpler ones. (v) energy present in the complex substances is converted into (vi) energy. (vii) is an example of this type of metabolism. (ii) includes all (viii) and is also known as (ix) metabolism since it involves the synthesis of complex substances from simpler ones. (x) is an example of this type of metabolism.

(B) Read the given passage and correct the errors, wherever present.

Key or taxonomic key is a natural analytic device having a list of statements with trichotomic table of alternate characteristics which is used for identifying organisms. Usually three contrasting characters are used. Each statement of the key is called graph. Same taxonomic keys are used for each taxonomic category like family, genus and species. Two types of keys commonly used are indented and bracketed. Bracketed key contains a sequence of choices between two or more characteristics. By careful selection of character at each subdivision the exact name of the organism can be arrived at. Indented key uses contrasting characters but they are not separated by intervening subdividing characters. Instead, each character is given a number in brackets.

Assertion & Reason

In each of the following questions, a statement of Assertion (A) is given and a corresponding statement of Reason (R) is given just below it. Of the statements, mark the correct answer as :
(a) if both A and R are true and R is the correct explanation of A
(b) if both A and R are true but R is not the correct explanation of A
(c) if A is true but R is false
(d) if both A and R are false.

24. **Assertion :** Consciousness is the defining property of living organisms.
Reason : All organisms from primitive prokaryotes to most advanced and complex eukaryotes are able to sense and respond to environmental factors.

25. **Assertion :** The Phylum Chordata of animals contains Class Mammalia, Aves, Reptilia, Amphibia, Cyclostomata, Chondrichthyes, Osteichthyes etc.
Reason : Phylum is the highest taxonomic category.

26. **Assertion :** Classical systematics is based on the study of mainly morphological traits of one or a few specimens with supporting evidences from other field.

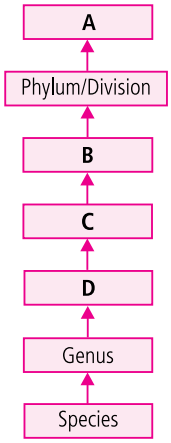
Reason : Classical systematics studies primitiveness, advancement and inter-relationships of species.

27. **Assertion :** Taxon represents the real organisms while category represents an abstract term.
Reason : Taxon may belong to any ranking while category belongs to one particular ranking.

28. **Assertion :** A cellular organelle develops a property which is also found in its interacting molecular components.
Reason : A living being has single level organisation.

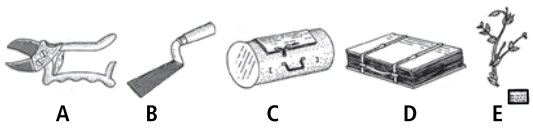
Figure Based Questions

29. Refer to the given flow chart and answer the following questions.



(a) Identify A, B, C and D in the given flowchart.
(b) Which labelled part share more similar characteristics?
(c) Briefly describe labelled part C.

30. Refer to the given figure and answer the following questions.



(a) Identify A, B, C, D and E in the given figure.
(b) Briefly describe labelled part E.

CHAPTER-2 : BIOLOGICAL CLASSIFICATION

Multiple Choice Questions

1. Dikaryon formation is characteristic of
(a) Ascomycetes and Basidiomycetes
(b) Phycomycetes and Basidiomycetes
(c) Ascomycetes and Phycomycetes
(d) Phycomycetes and Zygomycetes.

2. Which of the following pigment is present in cyano-bacteria?
(a) Chlorophyll '*a*' (b) Chlorophyll '*b*'
(c) Chlorophyll '*c*' (d) Chlorophyll '*d*'

3. In which group of organisms the cell walls form two thin overlapping shells which fit together?
(a) Dinoflagellates (b) Slime moulds
(c) Chrysophytes (d) Euglenoids

4. A bacteria undergoes binary fission in every minute. This bacterium can fill up a cup in 1 hour. In how much time will the cup be half filled?
(a) 30 minutes (b) 59 minutes
(c) 25 minutes (d) 55 minutes

5. The fungus often studied in experimental genetics and also called as "*Drosophila* of the plant kingdom" is
(a) *Erysiphe* (b) *Neurospora*
(c) *Rhizopus* (d) *Aspergillus.*

6. Maximum modes of nutrition are found in
(a) Monera (b) Animalia
(c) Fungi (d) Plantae.

7. Which of the following fungus produces ergot of rye?
(a) *Claviceps* (b) *Saccharomyces*
(c) *Sclerotinia* (d) *Erysiphe*

8. *Thermococcus, Methanococcus* and *Methanobacterium* exemplify
(a) bacteria whose DNA is relaxed or positively supercoiled but which have a cytoskeleton as well as mitochondria
(b) bacteria that contain a cytoskeleton and ribosomes
(c) archaebacteria that contains protein homologous to eukaryotic core histones
(d) archaebacteria that lack any histones resembling those found in eukaryotes but whose DNA is negatively supercoiled.

9. The conidiophores of *Penicillium* are
(a) uninucleate and colourless
(b) uninucleate and pigmented
(c) binucleate and pigmented
(d) binucleate and colourless.

10. As per Whittaker's classification, an organism possessing eukaryotic cell structure, multicellular organisation, with a cell wall and nuclear membrane showing heterotrophic nutrition can be placed under Kingdom
(a) Monera (b) Protista
(c) Animalia (d) Fungi.

True or False

11. The RNA of the viroid is of high molecular weight.

12. Dinoflagellates are mostly fresh water and saprophytic.

13. The mycoplasma are organisms that completely lack a cell wall.

14. Viruses contain either RNA or DNA as a genetic material.

15. Bladderwort and Venus fly trap are parasitic plants and *Cuscuta* is an insectivorous plant.

16. The body of fungus is filamentous and is called hyphae and the filaments are known as mycelium.

17. Virus having an arthropod as vector or intermediate host is called arbovirus.

18. Prions are highly resistant glycoprotein particles which function as infectious agents.

19. Mycorrhiza is the mutually beneficial or symbiotic association of a fungus with the root of a higher plant.

20. *Noctiluca* was the first dinoflagellates where bioluminescence was reported.

Match The Columns

21. Match Column I with Column II.

Column I		Column II	
A.	Red tides	(i)	*Beggiatoa*
B.	Golden algae	(ii)	Desmids
C.	Sulphur bacteria	(iii)	*Gonyaulax*
D.	Death cap	(iv)	*Euglena*
E.	Mixotrophic	(v)	*Amanita phalloides*

22. Match Column I with Column II. (There can be more than one match for items in Column I).

Column I		Column II	
A.	Symbiotic protists	(i)	*Penicillium*
B.	Sac fungi	(ii)	*Trichoderma*
C.	Imperfect fungi	(iii)	*Trichonympha*
D.	Usnic acid	(iv)	*Spirogyra*
E.	Chrysophytes	(v)	*Navicula*
		(vi)	*Lophomonas*
		(vii)	*Usnea*
		(viii)	*Saccharomyces*
		(ix)	*Cladonia*
		(x)	*Colletotrichum*

Passage Based Questions

23.(A) Complete the given passage with appropriate words or phrases.

Plasmids are small extrachromosomal rings of (i) discovered by (ii). They can (iii) independent of nucleoid. Some plasmids can temporarily associate with nucleoid called (iv). Today plasmids have become important tool in (v) because they are used as (vi) for introduction of genes. Plasmids can also pass from one (vii) to another, therefore, they are called (viii) plasmids. Plasmids which do not confer any useful trait to the cells are called (ix) plasmids. Three types of useful plasmids are F-plasmids, R-plasmids and (x) plasmids.

(B) Read the given passage and correct the errors, wherever present.

Methanogens are aerobes. Nutritionally they are heterotrophs which obtain both energy and carbon from decomposition products. They occur in dry areas where they convert acetic acid and carbon dioxide into ethane with the help of nitrogen. *Methanobacterium* a type of methanogen lives as parasite inside rumen or first chamber of the stomach of carnivorous animals.

Assertion & Reason

In each of the following questions, a statement of Assertion (A) is given and a corresponding statement of Reason (R) is given just below it. Of the statements, mark the correct answer as :

(a) if both A and R are true and R is the correct explanation of A
(b) if both A and R are true but R is not the correct explanation of A
(c) if A is true but R is false
(d) if both A and R are false.

24. **Assertion :** Deuteromycetes are commonly known as imperfect fungi.

Reason : In deuteromycetes only the asexual or vegetative phases are known.

25. **Assertion :** *Gonyaulax catenella* are poisonous to vertebrates.

Reason : *Gonyaulax catenella* produce saxitoxin into the sea water which kills fishes and other aquatic animals.

26. **Assertion :** The plasmodia of slime moulds are an excellent material for the study of structure and physiology of protoplasm.

Reason : The plasmodium is wall-less mass of uninucleate protoplasm covered by slime.

27. **Assertion :** Nucleoid represents the genetic material of prokaryotes.

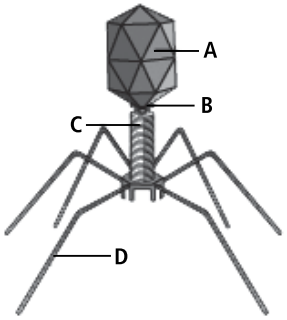
Reason : Nucleoid consists of double helical strand of DNA.

28. **Assertion :** Sexual reproduction in zygomycetes produces a resting spore called zygospores.

Reason : During the formation of zygospores in zygomycetes a distinct large food laden non-motile female gamete is not produced.

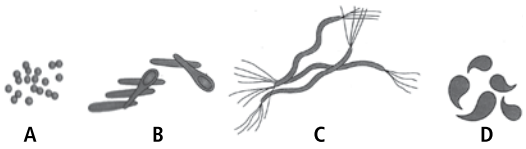
Figure Based Questions

29. Refer to the given figure and answer the following questions.



(a) Identify A, B, C and D in the given figure.
(b) Name the genetic material present in labelled part A.
(c) Write the functions of labelled part D.

30. Refer to the given figure and answer the following questions.



(a) Identify labelled part A, B, C and D in the given figure.
(b) Which labelled part causes cholera in human?
(c) Briefly describe labelled part A.

CHAPTER-3 : PLANT KINGDOM

Multiple Choice Questions

1. In Class Phaeophyceae the major pigment is
(a) fucoxanthin (b) phycoerythrin
(c) chlorophyll *d* (d) chlorophyll *b*.

2. *Cycas* and *Adiantum* resemble each other in having
(a) seeds (b) motile sperms
(c) cambium (d) vessels.

3. Which of the following is the character of Class-Bryopsida?
(a) Multicellular rhizoids
(b) Gametophyte consists of a prostate protonema and an erect gametophore
(c) Spirally arranged leaves
(d) All of these

4. In bryophytes the sperms are attracted towards the egg by
(a) moving currents of water
(b) opposite electric charges
(c) chemical secretions
(d) thread-like guides produced by the archegonium.

5. Alternation between a gamete producing and a spore-producing generation exists in
(a) bryophytes (b) vascular plants
(c) some thallophytes (d) all of these.

6. Which of the following is a protective structure of *Marchantia*?
(a) Elater (b) Perichaetium
(c) Paraphyses (d) Trichome

7. Angiosperms have dominated the land flora primarily because of their
(a) power of adaptability in diverse habitat
(b) property of producing large number of seeds
(c) nature of self pollination
(d) domestication by man.

8. Pteridophytes differ from the mosses in having
(a) motile antherozoids
(b) archegonia
(c) well-developed vasculature
(d) alternation of generation.

9. Both conifers and *Cycas* have
(a) motile sperms
(b) motile and non-motile sperms respectively
(c) non-motile sperms
(d) non-motile and motile sperms respectively.

10. Angiospermic and gymnospermic seeds are different because
(a) gymnosperm seeds are not enclosed in fruits
(b) endosperm in gymnosperms is haploid
(c) endosperm in angiosperms is triploid
(d) all of these.

True or False

11. *Ulothrix* is characterised by oogamous type of reproduction.

12. Protonema stage of a gametophyte in mosses develops directly from a spore.

13. Pteridophytes are characterised by the absence of vascular tissue.

14. In bryopsida, sex organs occur in clusters.

15. *Nostoc* and *Anabaena* form symbiotic association with coralloid roots of *Cycas*.

16. In angiosperms, flowers are generally unisexual and rarely bisexual.

17. Psilophytes are the primitive vascular plants characterised by the presence of roots.

18. Fertile leaves of ferns are known as sporophylls.

19. Meiosis, in haplontic life cycle occurs at the time of germination of the zygote.

20. Conifers have sympodial growth where the main axis of trunk rises straight from base.

Match The Columns

21. Match Column I with Column II.

Column I	Column II
A. Agar	(i) *Polysiphonia*
B. Bromine	(ii) *Chondrus*
C. Iodine	(iii) *Gelidium*
D. Carrageenan	(iv) *Gloiopeltis*
E. Funori	(v) *Laminaria*

22. Match Column I with Column II. (There can be more than one match for items in Column I).

Column I	Column II
A. Mosses	(i) *Riccia*
B. Psilophytes	(ii) *Selaginella*
C. Gnetopsida	(iii) *Psilotum*
D. Liverworts	(iv) *Funaria*
E. Lycopods	(v) *Marchantia*
	(vi) *Ephedra*
	(vii) *Welwitschia*
	(viii) *Lycopodium*
	(ix) *Tmesipterus*
	(x) *Sphagnum*

Passage Based Questions

23.(A) Complete the given passage with appropriate words or phrases.

The predominant stage in life cycle of a moss is the (i) which consists of (ii) stages. The first stage is (iii) stage, which develop directly from a (iv). It is creeping, green, branched and frequently filamentous stage. The second stage is (v) stage, which develops from (vi) protonema as a (vii) bud. They consist of upright slender axes bearing spirally arranged leaves. They are attached to soil through multicellular and branched (viii). This stage bears the (ix).

(B) Read the given passage and correct the errors, wherever present.

In *Adiantum*, the sori are borne submarginally at the proximal end on the under surface of the leaflets. The margin of the leaflet is reflexed to cover sorus. This reflexed margin is known as true indusium. A sorus consists of sclerenchymatous cushion or placenta. The placenta bears a number of stalked biconcave sporangia having a single layered jacket cells. A marginal row of jacket cells are differentially thickened to form stomium. The remaining marginal cells constitute annulus. The diploid spore mother cells divide mitotically to form diploid spores. With the maturity the indusium shrivels.

Assertion & Reason

In each of the following questions, a statement of Assertion (A) is given and a corresponding statement of Reason (R) is given just below it. Of the statements, mark the correct answer as :

(a) if both A and R are true and R is the correct explanation of A
(b) if both A and R are true but R is not the correct explanation of A
(c) if A is true but R is false
(d) if both A and R are false.

24. **Assertion :** Most of the red algae are marine.
Reason : Red algae contain red pigment anthocyanin.

25. **Assertion :** Gametophytic plant body of bryophytes dominate over sporophytic plant body.
Reason : Gametophytes produce gametes whereas sporophytes produce spores.

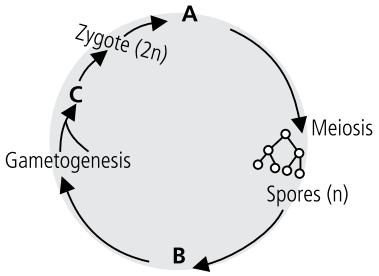
26. **Assertion :** *Eucalyptus regnans* is the largest angiosperm.
Reason : The height of *Eucalyptus regnans* is 114 m.

27. **Assertion :** Pteridosperms or cycadofilicales are considered intermediate between cycads and ferns.
Reason : Pteridosperms or cycadofilicales are an extinct group in which first seed was formed.

28. **Assertion :** Conifers are usually dioecious.
Reason : Male and female cone in conifers are borne on different plants.

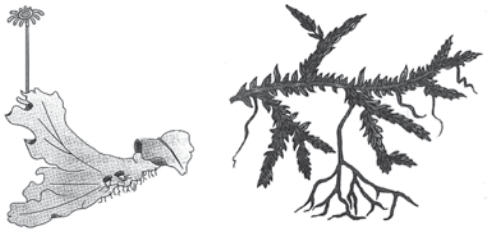
Figure Based Questions

29. Refer to the given figure and answer the following questions.



(a) Which type of life cycle pattern is represented by the given figure?
(b) Identify A, B and C in the given figure.
(c) Name two organisms that exhibit this type of life cycle pattern.
(d) Describe alternation of generation that exists between A and B in this type of life cycle.

30. Refer to the given figures and answer the following questions.



A B

(a) Name the plants and their division respectively represented by the given figures A and B.

(b) Which labelled plant belongs to the plant group known as amphibians of the plant kingdom and why the plant group is named so?

(c) Write economic importance of the division represented by plant B.

CHAPTER-4 : ANIMAL KINGDOM

Multiple Choice Questions

1. *Fasciola hepatica* infects its intermediate host and primary host at the following larval stages respectively
(a) redia and miracidium
(b) cercaria and redia
(c) metacercaria and cercaria
(d) miracidium and metacercaria.

2. Which of the following is/are characters of the member of Phylum Porifera?
(a) Sexes are not separate.
(b) Fertilisation is internal and development is indirect.
(c) Larval stage is morphologically distinct from the adult.
(d) All of these

3. Which of the following are correct for axolotl larva?
I. It shows neoteny.
II. Absence of thyroxin affects metamorphosis.
III. It is the larva of Hemichordata.
(a) I, II and III (b) I and II
(c) II and III (d) III

4. Which one of the following phyla is correctly matched with its two general characteristics?
(a) Arthropoda - Body is divided into head, thorax and abdomen and respiration by tracheae
(b) Chordata - Notochord at some stages and ventral central nervous system
(c) Echinodermata - Pentamerous radial symmetry and mostly internal fertilisation
(d) Mollusca - Normally viviparous and development through a trochophore or veliger larva.

5. Larval stage of *Pleurobrachia* is
(a) planula larva (b) ephyra larva
(c) cydippid larva (d) rhabditiform larva.

6. All mammals are viviparous except
(a) *Macropus* (b) *Ornithorhynchus*
(c) *Equus* (d) *Balaenoptera*.

7. A common scent producing gland among mammals is
(a) anal gland (b) prostate gland
(c) adrenal gland (d) Bartholin's gland.

8. Which of the following animal has a notochord throughout its life?
(a) *Bufo* (b) *Herdmania*
(c) *Columba* (d) *Amphioxus*

9. Which of the following sets of animals belongs to the same class of a phylum?
(a) *Hydra*, jellyfish, crayfish
(b) Bat, pigeon, whale
(c) Whale, shark, kangaroo
(d) Spider, scorpion, tick

10. Phylum Echinodermata
(a) is the largest animal's phylum to lack any marine water or terrestrial representatives
(b) constitutes the only major group of deuterostome
(c) are having diploblastic animals
(d) have direct development without any larval stages.

True or False

11. Comb plates in ctenophores help in locomotion.

12. A well-developed muscular pharynx is present in members of Class Aschelminthes.

13. *Ichthyophis* has a two chambered heart with one auricle and one ventricle.

14. Members of Phylum Porifera are multicellular, mostly fresh water and radially symmetrical animals.

15. Gills, book gills and book lungs are respiratory organs in animals of Phylum Echinodermata.

16. Class Osteichthyes include both marine and fresh water fishes with cartilaginous endoskeleton.

17. Dry skin with complete absence of glands is a characteristic feature of members of Class Aves.

18. In Urochordates, notochord extends from head to tail and is persistent throughout life while in Cephalochordates notochord is present only in larval tail.

19. Proboscis glands are the chief excretory organs found in *Balanoglossus*.

20. Presence of hair over skin is a unique feature of Class Mammalia.

Match The Columns

21. Match Column I with Column II.

Column I		Column II	
A.	Porifera	(i)	Bioluminescence
B.	Arthropoda	(ii)	Radula
C.	Echinodermata	(iii)	Water vascular system
D.	Ctenophora	(iv)	Malpighian tubules
E.	Mollusca	(v)	Choanocytes

22. Match Column I with Column II. (There can be more than one match for items in Column I).

Column I		Column II	
A.	Ctenophora	(i)	*Salpa*
B.	Urochordates	(ii)	*Petromyzon*
C.	Chondricthyes	(iii)	*Echinus*
D.	Cyclostomata	(iv)	*Ctenoplana*
E.	Echinodermata	(v)	*Doliolum*
		(vi)	*Pristis*
		(vii)	*Pleurobrachia*
		(viii)	*Myxine*
		(ix)	*Trygon*
		(x)	*Ophiura*

Passage Based Questions

23.(A) Complete the given passage with appropriate words or phrases.

Ctenophores are commonly known as (i) or (ii). They are exclusively (iii), radially symmetrical, diploblastic organisms with (iv) level of organisation. Their body bears (v) external rows of ciliated comb plates, which help in (vi). Bioluminescence is well-marked in ctenophores. Sexes are (vii). Reproduction is (viii) type. Fertilisation is (ix) and development is (x).

(B) Read the given passage and correct the errors, wherever present.

Porifera includes multicellular animals which exhibit tissue level of organisation and have characteristic ciliated choanocytes. The coelenterates have tentacles and bear cnidophores. They are mostly aquatic, sessile or free-floating. The ctenophores are marine animals with six comb plates. The platyhelminthes have flat body and exhibit radial symmetry. The parasitic forms show distinct suckers and hooks. Aschelminthes are acoelomates and include parasitic as well as non-parasitic round worms. Annelids are metamerically segmented animals with a false coelom. The arthropods are the most abundant group of animals characterised by the presence of jointed forelimbs. The molluscs have a soft body surrounded by an external calcareous shell. They have iron containing respiratory pigment. The echinoderms possess a smooth skin. Their most distinctive feature is the presence of water vascular system. The hemichordates are a small group of worm-like marine animals. They have a cylindrical body with proboscis, collar and trunk.

Assertion & Reason

In each of the following questions, a statement of Assertion (A) is given and a corresponding statement of Reason (R) is given just below it. Of the statements, mark the correct answer as :

(a) if both A and R are true and R is the correct explanation of A
(b) if both A and R are true but R is not the correct explanation of A
(c) if A is true but R is false
(d) if both A and R are false.

24. **Assertion :** All triploblastic animals are eucoelomates.
Reason : They have a false coelom.

25. **Assertion :** Urochordate's tadpole larva is more chordate-like than the adult.
Reason : Tadpole changes into an adult by retrogressive metamorphosis.

26. **Assertion :** The duck-billed platypus and the spiny anteater are egg-laying mammals yet they are grouped under mammals.
Reason : Both of them have seven cervical vertebrae and twelve pairs of cranial nerves.

27. **Assertion :** Air sacs are connected to lungs in birds.
Reason : Air sacs supplement respiration in birds.

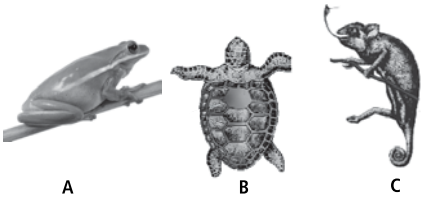
28. **Assertion :** Air bladder is present in member of Class Chondrichthyes.
Reason : Air bladder regulate buoyancy in Chondrichthyes fishes.

Figure Based Questions

29. Refer to the given figure and answer the following questions.

(a) What type of body cavity is represented by the given figure?
(b) Name the phylum that possess this type of body cavity?
(c) How is mesoderm organised in such type of body cavity?

30. Refer to the given figure and answer the following questions.



A B C

(a) Identify the animals A, B and C shown in the above figures.
(b) Identify the classes to which A, B and C belong.
(c) How is the mode of fertilisation of A different from mode of fertilisation of B?

SOLUTIONS

CHAPTER-1 : THE LIVING WORLD

1. (a) **2.** (b) **3.** (d) **4.** (b) **5.** (a)
6. (d) **7.** (b) **8.** (b) **9.** (c) **10.** (c)

11. **True**

12. **False :** Manual is handy book containing instructions as to occurrence, collection and identification of species found in a particular area.

13. **False :** All organisms have species as the lowest category.

14. **False :** The keys are based on the contrasting characters generally in a pair called couplet.

15. **True** **16.** **True**

17. **False.** Growth occurs when anabolism exceeds catabolism.

18. **False.** Classical taxonomy does not study evolution and inter-relationships of species.

19. **True**

20. **False.** Taxonomic studies consider a group of individual organisms with fundamental similarities as a species.

21. A-(ii), B-(iv), C-(v), D-(iii), E-(i)

22. A-(ii, ix), B-(iii, x), C-(i, iv), D-(v, vii), E-(vi, viii)

23. **(A)** (i) catabolism (ii) anabolism
(iii) breakdown reactions
(iv) destructive metabolism
(v) Potential (vi) kinetic
(vii) Respiration (viii) building up reactions
(ix) constructive (x) Photosynthesis

(B) Key or taxonomic key is ~~a natural~~ an artificial analytic device having a list of statements with ~~trichotomic~~ dichotomic table of alternate characteristics which is used for identifying organisms. Usually ~~three~~ two contrasting characters are used. Each statement of the key is called ~~graph~~ lead. ~~Same~~ Separate taxonomic keys are used for each taxonomic category like family, genus and species. Two types of keys are commonly used indented and bracketed. ~~Bracketed~~ Indented key contains a sequence of choices between two or more characteristics. By careful selection of character at each subdivision the exact name of the organism can be arrived at. ~~Indented~~ Bracketed key uses contrasting characters but they are not separated by intervening subdividing characters. Instead, each character is given a number in brackets.

24. (a) **25.** (c) **26.** (c) **27.** (b) **28.** (d)

29. **(a)** A-Kingdom, B-Class, C-Order, D-Family

(b) The given flow chart represents taxonomic categories showing hierarchial arrangement in ascending order. Labelled part D (Family) share more similar characteristics.

(c) Labelled part C in the given flow chart represents Order. It is a type of taxonomic category with one or more related families sharing certain similar characters. For example, the Family Solanaceae is placed in the Order Polynomiales alongwith four other related families such as Convolvulaceae, Boraginaceae, Hydrophyllaceae and Polemoniaceae.

30. **(a)** The given figure represents tools for plant collection which are used for herbarium preparation. A-Cutter, B-Digger, C-Vasculum, D-Plant press, E-Herbarium sheet.

(b) Labelled part E represents herbarium sheet. The general size is 30 × 45 cm. It is slightly shorter in American herbaria (29 × 41 cm). This sheet contains dried and pressed plant specimen with labels (7 × 12 cm) which are fixed over the lower right hand corner of the sheets. Each label has information about the family, genus, species, author, plant characteristics, area, date and collector's name.

CHAPTER-2 : BIOLOGICAL CLASSIFICATION

1. (a) **2.** (a) **3.** (c) **4.** (b) **5.** (b)
6. (a) **7.** (a) **8.** (d) **9.** (b) **10.** (d)

11. **False :** The RNA of the viroid is of low molecular weight.

12. **False :** Dinoflagellates are mostly marine and photosynthetic.

13. **True** **14.** **True**

15. **False.** Bladderwort and Venus fly trap are insectivorous plants and *Cuscuta* is a parasitic plant.

16. **False.** The body of fungus is filamentous and is called mycelium and the filaments are known as hyphae.

17. **True** **18.** **True**

19. **True** **20.** **True**

21. A-(iii), B-(ii), C-(i), D-(v), E-(iv)

22. A-(iii, vi), B-(i, viii), C-(ii, x), D-(vii, ix), E-(iv, v)

23.(A)

(i)	DNA	(ii)	Hayes and Lederberg
(iii)	replicate	(iv)	episomes
(v)	genetic engineering	(vi)	vectors
(vii)	bacterium	(viii)	transfer
(ix)	cryptic	(x)	Col-

(B) Methanogens are ~~aerobes~~ anaerobes. Nutritionally they are ~~heterotrophs~~ autotrophs which obtain both energy and carbon from decomposition products. They occur in ~~dry~~ marshy areas where they convert ~~acetic acid~~ formic acid and carbon dioxide into ~~ethane~~ methane with the help of ~~nitrogen~~ hydrogen. *Methanobacterium* a type of methanogen lives as ~~parasite~~ symbiont inside rumen or first chamber of the stomach of ~~carnivorous~~ herbivorous animals.

24. (a) **25.** (a) **26.** (c) **27.** (c) **28.** (b)

29. **(a)** A-Head, B-Collar, C-Tail sheath, D-Tail fibres.

(b) The given figure represents bacteriophage, labelled part A represents head which contains double stranded or dsDNA as genetic material.

(c) The labelled part D represents tail fibres of bacteriophage. Main functions of this tail fibre are as follows:

(i) The phage attaches itself to the host with the help of tail fibres.

(ii) The fibres bend and bring the tip of tail in contact with host cell wall.

(iii) The tip of tail produces hole in bacterial cell wall by secreting lysozyme.

30. **(a)** The given figure shows different types of bacterial cells – A-Cocci, B-Bacilli, C-Spirilla, D-Vibrio.

(b) The labelled part 'D' represents vibrio or comma shaped bacteria. *Vibrio cholerae* causes cholera in human.

(c) Labelled part 'A' represents cocci shape of bacteria which are spherical or ovoid in outline. Depending upon their grouping they are called (i) Monococcus- occurring singly, (ii) Diplococcus - occurring in twos, (iii) Tetracoccus - occurring in tetrads, (iv) Streptococcus - occurring in chains, (v) Staphylococcus - occurring in irregular grape-like clusters, (vi) Sarcina - occurring in three dimensional geometrical forms.

CHAPTER-3 : PLANT KINGDOM

1. (a) **2.** (b) **3.** (d) **4.** (c) **5.** (d)
6. (b) **7.** (a) **8.** (c) **9.** (d) **10.** (d)

11. **False :** *Ulothrix* is characterised by isogamous type of reproduction.

12. **True**

13. **False :** Pteridophytes possess well differentiated vascular tissue.

14. **True** **15.** **True**

16. **False.** In angiosperms, flowers are generally bisexual and rarely unisexual.

17. **False.** Psilophytes are primitive vascular plants. Roots are absent in psilophytes instead rhizoids occur.

18. **True** **19.** **True**

20. **False.** Conifers have monopodial growth where the main axis of trunk rises straight from base.

21. A-(iii), B-(i), C-(v), D-(ii), E-(iv)

22. A-(iv, x), B-(iii, ix), C-(vi, vii), D-(i, v), E-(ii, viii)

23.(A)

(i)	gametophyte	(ii)	two
(iii)	protonema	(iv)	spore
(v)	leafy	(vi)	secondary
(vii)	lateral	(viii)	rhizoids
(ix)	sex organs		

(B) In *Adiantum*, the sori are borne submarginally at the ~~proximal~~ distal end on the under surface of the leaflets. The margin of the leaflet is reflexed to cover sorus. This reflexed margin is known as ~~true~~ false indusium. A sorus consists of ~~sclerenchymatous~~ parenchymatous cushion or placenta. The placenta bears a number of stalked ~~biconcave~~ bioconvex sporangia having a single layered jacket cells. A marginal row of jacket cells are differentially thickened to form ~~stomium~~ annulus. The remaining marginal cells constitute ~~annulus~~ stomium. The diploid spore mother cells divide ~~mitotically~~ meiotically to form ~~diploid~~ haploid spores. With the maturity the indusium shrivels.

24. (c) **25.** (b) **26.** (b) **27.** (b) **28.** (d)

29. **(a)** The given figure represents haplodiplontic type of life cycle.

(b) A represents a diploid sporophyte, B represents a haploid gametophyte and C represents syngamy.

(c) Bryophytes and pteridophytes exhibit haplodiplontic type of life cycle.

(d) The sporophyte (A) possesses diploid chromosome number (2n). Meiosis takes place in it at the time

of formation of meiospores. The haploid meiospores germinate to produce haploid gametophytes (B). The gametophytes produce gametes. The fusion product of gametes is a diploid zygote which develops into the sporophytic thallus of the progeny. There is thus a clear alternation of generations between a haploid gamete producing gametophyte and a diploid spore producing sporophyte in diplohaplontic life history.

30. (a) The given figures A and B represent *Marchantia* (Division Bryophyta) and *Selaginella* (Division Pteridophyta) respectively.

(b) Plant A, *Marchantia* belongs to plant group bryophytes. Bryophytes are called amphibians of plant kingdom as they require an external layer of water on the soil surface for their existence. The external water is required for (a) dehiscence of antheridia and archegonia (b) swimming of male gametes to archegonia (c) protection from transpiration and hence desiccation as the plant body is not covered by cuticle (d) supply of water to all parts through capillarity as vascular tissues are absent in them.

(c) The economic importance of pteridophytes is as follows: (i) Food : Pteridophytes constitute a good source of food to animals. For example sporocarps of *Marsilea*, a water fern, yield starch that is cooked and eaten by certain tribal people. (ii) Soil binding: Pteridophytes bind the soil even along hill slopes and thus protect the soil from erosion. (iii) Scouring: *Equisetum* stems have been used in scouring *i.e.*, cleaning of utensils and polishing of metals. (iv) Nitrogen fixation : *Azolla* (a water fern) has a symbiotic association with nitrogen fixing cyanobacterium *Anabaena azollae*. (v) Medicines: An anthelmintic drug is obtained from rhizomes of *Dryopteris* (male shield fern). (vi) Ornamentals: Ferns are grown as ornamental plants for their delicate and graceful leaves.

CHAPTER-4 : ANIMAL KINGDOM

1. (d) **2.** (d) **3.** (b) **4.** (a) **5.** (c)
6. (b) **7.** (a) **8.** (d) **9.** (d) **10.** (b)

11. True **12. True**

13. False : *Ichthyophis* (limbless amphibian) has a three chambered heart with two auricles and one ventricle.

14. False : Members of Phylum Porifera are multicellular, mostly marine and most are asymmetrical animals, some are radially symmetrical.

15. False : Gills, book gills and book lungs are respiratory organs in animals of Phylum Arthropoda.

16. False. Class Osteichthyes include both marine and fresh water fishes with bony endoskeleton.

17. False. Reptiles have dry and rough skin without any glands. In birds, uropygial glands are present.

18. False. In Urochordata, notochord is present only in larval tail, while in Cephalochordata, it extends from head to tail region and is persistent throughout their life.

19. True **20. True**

21. A-(v), B-(iv), C-(iii), D-(i), E-(ii)

22. A-(iv, vii), B-(i, v), C-(vi, ix), D-(ii, viii), E-(iii, x)

23.(A)

(i)	sea walnuts	(ii)	comb jellies
(iii)	marine	(iv)	tissue
(v)	eight	(vi)	locomotion
(vii)	not separate	(viii)	sexual
(ix)	external	(x)	indirect

(B) Porifera includes multicellular animals which exhibit ~~tissue~~ cellular level of organisation and have characteristic ~~ciliated~~ flagellated choanocytes. The coelenterates have tentacles and bear ~~enidophores~~ cnidoblasts. They are mostly aquatic, sessile or free-floating. The ctenophores are marine animals with ~~six~~ eight comb plates. The platyhelminthes have flat body and exhibit ~~radial~~ bilateral symmetry. The parasitic forms show distinct suckers and hooks. Aschelminthes are ~~acoelomates~~ pseudocoelomates and include parasitic as well as non-parasitic round worms. Annelids are metamerically segmented animals with a ~~false~~ true coelom. The arthropods are the most abundant group of animals characterised by the presence of jointed ~~forelimbs~~ appendages. The molluscs have a soft body surrounded by an external calcareous shell. They have ~~iron~~ copper containing respiratory pigment. The echinoderms possess a ~~smooth~~ spiny skin. Their most distinctive feature is the presence of water vascular system. The hemichordates are a small group of worm-like marine animals. They have a cylindrical body with proboscis, collar and trunk.

24. (d) **25.** (a) **26.** (a) **27.** (a) **28.** (d)

29. (a) The given figure represents pseudocoelom type of body cavity.

(b) Members of Phylum Aschelminthes possess pseudocoelomate type of body cavity.

(c) In pseudocoelomate condition, the body cavity is not lined by mesoderm, instead it is present as scattered pouches in between ectoderm and endoderm.

30. (a) The given figures A, B and C represents *Hyla* (tree frog), *Chelone* and chameleon respectively.

(b) A belongs to Class Amphibia, B and C belong to Class Reptilia.

(c) Figure A represents *Hyla* which is a member of Class Amphibia. In amphibians, fertilisation is external whereas B represents *Chelone* which is a member of Class Reptilia. In reptilians, fertilisation is internal.

☺☺

NEET

Phase-I held on 1st May

SOLVED PAPER 2016

Hurray!! We are happy to inform our readers that out of the 90 questions asked in NEET 2016, more than 60% questions were either exactly same or of similar type from the **MTG Books.** Hurray!!

Here, the references of few are given :

S. No.	MTG Books	Q. No.	Pg. No.
1	NCERT Fingertips/ NEET Guide	63/29	370(XII)/640
4	NCERT Fingertips/ 29 years NEET/ NEET Guide	85/7/125	423 (XII)/ 499/644
5	NCERT Fingertips/ NEET Guide	17/177	4 (XI)/54
7	NCERT Fingertips	43	310 (XII)
9	NCERT Fingertips	49	298 (XI)
13	NCERT Fingertips	129	120 (XII)
14	NCERT Fingertips/ 29 years NEET/ NEET Guide	9, 14/21/193	86, 87 (XII)/ 322/419
19	NCERT Fingertips/ 29 years NEET/ NEET Guide	80/4/99	32 (XII)/ 287/414
20	NCERT Fingertips/ NEET Guide	91/339	381 (XI)/337
21	NCERT Fingertips/ 29 years NEET/ NEET Guide	59/100/49	148 (XII)/ 367/481

S. No.	MTG Books	Q. No.	Pg. No.
22	NCERT Fingertips/ 29 years NEET/ NEET Guide	32/16/163	229 (XI)/ 151/159
28	NCERT Fingertips	99	405 (XI)
30	29 years NEET	71	365
31	NCERT Fingertips	55	180 (XI)
34	NCERT Fingertips	71	351 (XI)
42	NCERT Fingertips/ 29 years NEET	72/26	81 (XI)/53
43	NCERT Fingertips	7	25 (XI)
44	NCERT Fingertips	65	207 (XII)
47	NCERT Fingertips	85	286 (XII)
49	NEET Guide	131	109

and more such questions .....

1. Which of the following would appear as the pioneer organisms on bare rocks?
(a) Mosses (b) Green algae
(c) Lichens (d) Liverworts

2. Water vapour comes out from the plant leaf through the stomatal opening. Through the same stomatal opening carbon dioxide diffuses into the plant during photosynthesis. Reason out the above statements using one of following options.
(a) The above processes happen only during night time.
(b) One process occurs during day time and the other at night.
(c) Both processes cannot happen simultaneously.
(d) Both processes can happen together because the diffusion coefficient of water and CO_2 is different.

3. Lack of relaxation between successive stimuli in sustained muscle contraction is known as
(a) tetanus (b) tonus
(c) spasm (d) fatigue.

4. Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancers?
(a) Ammonia (b) Methane
(c) Nitrous oxide (d) Ozone

5. Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature?
(a) The names are written in Latin and are italicised.
(b) When written by hand the names are to be underlined.
(c) Biological names can be written in any language.
(d) The first word in a biological name represents the genus name and the second is a specific epithet.

6. A cell at telophase stage is observed by a student in a plant brought from the field. He tells his teacher that this cell is not like other cells at telophase stage. There is no formation of cell plate and thus the cell is containing more number of chromosomes as compared to other dividing cells. This would result in

(a) somaclonal variation (b) polyteny
(c) aneuploidy (d) polyploidy.

7. The two polypeptides of human insulin are linked together by
(a) covalent bond (b) disulphide bridges
(c) hydrogen bonds (d) phosphodiester bond.

8. Reduction in pH of blood will
(a) decrease the affinity of haemoglobin with oxygen
(b) release bicarbonate ions by the liver
(c) reduce the rate of heart beat
(d) reduce the blood supply to the brain.

9. In a chloroplast the highest number of protons are found in
(a) intermembrane space (b) antennae complex
(c) stroma (d) lumen of thylakoids.

10. Which type of tissue correctly matches with its location?

	Tissue	**Location**
(a)	Transitional epithelium	Tip of nose
(b)	Cuboidal epithelium	Lining of stomach
(c)	Smooth muscle	Wall of intestine
(d)	Areolar tissue	Tendons

11. Which of the following pairs of hormones are not antagonistic (having opposite effects) to each other?

(a)	Aldosterone	Atrial Natriuretic Factor
(b)	Relaxin	Inhibin
(c)	Parathormone	Calcitonin
(d)	Insulin	Glucagon

12. In mammals, which blood vessel would normally carry largest amount of urea?
(a) Hepatic Vein (b) Hepatic Portal Vein
(c) Renal Vein (d) Dorsal Aorta

13. Pick out the correct statements.
(1) Haemophilia is a sex-linked recessive disease.
(2) Down's syndrome is due to aneuploidy.
(3) Phenylketonuria is an autosomal recessive gene disorder.
(4) Sickle cell anaemia is an X-linked recessive gene disorder.
(a) (1), (3) and (4) are correct.
(b) (1), (2) and (3) are correct.
(c) (1) and (4) are correct.
(d) (2) and (4) are correct.

14. Which of the following approaches does not give the defined action of contraceptive?

(a)	Hormonal contraceptives	Prevent/retard entry of sperms, prevent ovulation and fertilisation
(b)	Vasectomy	Prevents spermatogenesis
(c)	Barrier methods	Prevent fertilisation
(d)	Intra uterine devices	Increase phagocytosis of sperms, suppress sperm motility and fertilising capacity of sperms

15. Which one of the following characteristics is not shared by birds and mammals?
(a) Viviparity (b) Warm blooded nature
(c) Ossified endoskeleton (d) Breathing using lungs

16. Emerson's enhancement effect and Red drop have been instrumental in the discovery of
(a) photophosphorylation and cyclic electron transport
(b) oxidative phosphorylation
(c) photophosphorylation and non-cyclic electron transport
(d) two photosystems operating simultaneously.

17. In which of the following all three are macronutrients?
(a) Molybdenum, magnesium, manganese
(b) Nitrogen, nickel, phosphorus
(c) Boron, zinc, manganese
(d) Iron, copper, molybdenum

18. Changes in GnRH pulse frequency in females is controlled by circulating levels of
(a) progesterone only
(b) progesterone and inhibin
(c) estrogen and progesterone
(d) estrogen and inhibin.

19. The coconut water from tender coconut represents
(a) free nuclear proembryo
(b) free nuclear endosperm
(c) endocarp (d) fleshy mesocarp.

20. Which of the following guards the opening of hepatopancreatic duct into the duodenum?
(a) Pyloric sphincter (b) Sphincter of Oddi
(c) Semilunar valve (d) Ileocaecal valve

21. Which one of the following is the starter codon?
(a) UAA (b) UAG
(c) AUG (d) UGA

22. Spindle fibres attach on to
(a) centromere of the chromosome
(b) kinetosome of the chromosome
(c) telomere of the chromosome
(d) kinetochore of the chromosome.

23. A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the F_1 plants were selfed the resulting genotypes were in the ratio of
(a) 3 : 1 : : Tall : Dwarf
(b) 3 : 1 : : Dwarf : Tall
(c) 1 : 2 : 1 : : Tall homozygous : Tall heterozygous : Dwarf
(d) 1 : 2 : 1 : : Tall heterozygous : Tall homozygous : Dwarf

24. A typical fat molecule is made up of
(a) one glycerol and one fatty acid molecule
(b) three glycerol and three fatty acid molecules
(c) three glycerol molecules and one fatty acid molecule
(d) one glycerol and three fatty acid molecules.

25. A system of rotating crops with legume or grass pasture to improve soil structure and fertility is called
(a) strip farming (b) shifting agriculture
(c) ley farming (d) contour farming.

26. Which of the following is not a stem modification?
(a) Tendrils of cucumber
(b) Flattened structures of *Opuntia*
(c) Pitcher of *Nepenthes*
(d) Thorns of citrus

27. Which of the following features is not present in *Periplaneta americana*?
(a) Exoskeleton composed of N-acetylglucosamine
(b) Metamerically segmented body
(c) Schizocoelom as body cavity
(d) Indeterminate and radial cleavage during embryonic development

28. Name the chronic respiratory disorder caused mainly by cigarette smoking.
(a) Respiratory acidosis (b) Respiratory alkalosis
(c) Emphysema (d) Asthma

29. Which one of the following statements is not true?
(a) Pollen grains of many species cause severe allergies.
(b) Stored pollen in liquid nitrogen can be used in the crop breeding programmes.
(c) Tapetum helps in the dehiscence of anther.
(d) Exine of pollen grains is made up of sporopollenin.

30. Which of the following is required as inducer (s) for the expression of *Lac* operon?
(a) Lactose (b) Lactose and Galactose
(c) Glucose (d) Galactose

31. Mitochondria and chloroplast are
(A) semi-autonomous organelles
(B) formed by division of pre-existing organelles and they contain DNA but lack protein synthesising machinery.
Which one of the following options is correct?
(a) (A) is true but (B) is false.
(b) Both (A) and (B) are false.
(c) Both (A) and (B) are correct.
(d) (B) is true but (A) is false.

32. It is much easier for a small animal to run uphill than for a large animal, because
(a) small animals have a lower O_2 requirement
(b) the efficiency of muscles in large animals is less than in the small animals
(c) it is easier to carry a small body weight
(d) smaller animals have a higher metabolic rate.

33. Seed formation without fertilisation in flowering plants involves the process of
(a) somatic hybridisation (b) apomixis
(c) sporulation (d) budding.

34. The *Avena* curvature is used for bioassay of
(a) IAA (b) ethylene
(c) ABA (d) GA_3.

35. A plant in your garden avoids photorespiratory losses, has improved water use efficiency, shows high rates of photosynthesis at high temperatures and has improved efficiency of nitrogen utilisation. In which of the following physiological groups would you assign this plant?
(a) CAM (b) Nitrogen fixer
(c) C_3 (d) C_4

36. Which is the National Aquatic Animal of India?
(a) Blue whale (b) Sea-horse
(c) Gangetic shark (d) River dolphin

37. Which of the following is not a feature of the plasmids?
(a) Transferable
(b) Single-stranded
(c) Independent replication
(d) Circular structure

38. The amino acid tryptophan is the precursor for the synthesis of
(a) estrogen and progesterone
(b) cortisol and cortisone
(c) melatonin and serotonin
(d) thyroxine and triiodothyronine.

39. Joint Forest Management Concept was introduced in India during
(a) 1980s (b) 1990s
(c) 1960s (d) 1970s.

40. Water soluble pigments found in plant cell vacuoles are
(a) carotenoids (b) anthocyanins
(c) xanthophylls (d) chlorophylls.

41. Which one of the following is a characteristic feature of cropland ecosystem?
(a) Absence of weeds
(b) Ecological succession
(c) Absence of soil organisms
(d) Least genetic diversity

42. Which of the following characteristic features always holds true for the corresponding group of animals?

(a)	Possess a mouth with an upper and a lower jaw	Chordata
(b)	3–chambered heart with one incompletely divided ventricle	Reptilia
(c)	Cartilaginous endoskeleton	Chondrichthyes
(d)	Viviparous	Mammalia

43. The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the
(a) methanogens (b) eubacteria
(c) halophiles (d) thermoacidophiles.

44. Antivenom injection contains preformed antibodies while polio drops that are administered into the body contain
(a) gamma globulin (b) attenuated pathogens
(c) activated pathogens (d) harvested antibodies.

45. When does the growth rate of a population following the logistic model equal zero? The logistic model is given as dN/dt = rN(1–N/K)
(a) when N/K equals zero
(b) when death rate is greater than birth rate
(c) when N/K is exactly one
(d) when N nears the carrying capacity of the habitat.

46. Which one of the following statements is wrong?
(a) Uracil is a pyrimidine.
(b) Glycine is a sulphur containing amino acid.
(c) Sucrose is a disaccharide.
(d) Cellulose is a polysaccharide.

47. The *Taq* polymerase enzyme is obtained from
(a) *Bacillus subtilis* (b) *Pseudomonas putida*
(c) *Thermus aquaticus* (d) *Thiobacillus ferroxidans.*

48. Gause's principle of competitive exclusion states that
(a) no two species can occupy the same niche indefinitely for the same limiting resources
(b) larger organisms exclude smaller ones through competition
(c) more abundant species will exclude the less abundant species through competition
(d) competition for the same resources exclude species having different food preferences.

49. Stems modified into flat green organs performing the functions of leaves are known as
(a) phylloclades (b) scales
(c) cladodes (d) phyllodes.

50. Which part of the tobacco plant is infected by *Meloidogyne incognita*?
(a) Stem (b) Root
(c) Flower (d) Leaf

51. Fertilisation in humans is practically feasible only if
(a) the ovum and sperms are transported simultaneously to ampullary–isthmic junction of the cervix
(b) the sperms are transported into cervix within 48 hrs of release of ovum in uterus
(c) the sperms are transported into vagina just after the release of ovum in Fallopian tube
(d) the ovum and sperms are transported simultaneously to ampullary–isthmic junction of the Fallopian tube.

52. Which of the following statements is not true for cancer cells in relation to mutations?
(a) Mutations inactivate the cell control.
(b) Mutations inhibit production of telomerase.
(c) Mutations in proto-oncogenes accelerate the cell cycle.
(d) Mutations destroy telomerase inhibitor.

53. Which of the following structures is homologus to the wing of a bird?
(a) Hindlimb of rabbit (b) Flipper of whale
(c) Dorsal fin of a shark (d) Wing of a moth

54. Match the terms in column I with their description in column II and choose the correct option.

	Column I		Column II
A.	Dominance	(i)	Many genes govern a single character
B.	Codominance	(ii)	In a heterozygous organism only one allele expresses itself
C.	Pleiotropy	(iii)	In a heterozygous organism both alleles express themselves fully
D.	Polygenic inheritance	(iv)	A single gene influences many characters

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

55. Which of the following is wrongly matched in the given table?

	Microbe	Product	Application
(a)	*Streptococcus*	Streptokinase	Removal of clot from blood vessel
(b)	*Clostridium butylicum*	Lipase	Removal of oil stains
(c)	*Trichoderma polysporum*	Cyclosporin A	Immunosuppressive drug
(d)	*Monascus purpureus*	Statins	Lowering of blood cholesterol

CONCEPT MAP

SEXUAL REPRODUCTION

The process of development of new individuals through the formation and fusion of male and female gametes is known as sexual reproduction or amphimixis or syngenesis.

TYPES

Syngamy
It is the complete and permanent fusion of male and female gametes to form the zygote .

Conjugation
A process of sexual reproduction in which organisms of the same species temporarily couple and exchange or in some cases transfer their genetic material. It takes place in *Paramoecium*, *Spirogyra*, bacteria etc.

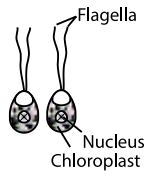
On the basis of source of fusing gametes

Endogamy
It is the fusion of male and female gametes of the same parent, hence, uniparental *e.g.*, *Taenia*.

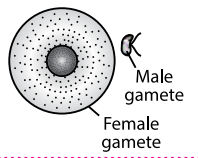
Exogamy
It is the fusion of two gametes produced by different parents, hence, biparental *e.g.*, Rabbit.

On the basis of structure of fusing gametes

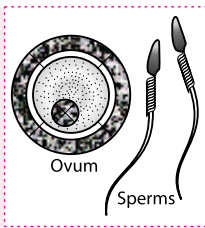
Isogamy
It involves the fusion of gametes which do not differ morphologically but may be different physiologically. It takes place in *Chlamydomonas*.



Anisogamy
It involves the fusion of gametes which differ in size or form. It takes place in *Chlamydomonas*, red algae etc.



Oogamy
It involves the fusion of large non-motile female gamete and a small motile male gamete. It takes place in some algae, vertebrates including human beings and higher invertebrates.



Hologamy
It involves the fusion of two organisms. It occurs in yeasts.

PHASES OF LIFE

Juvenile/Vegetative phase
It is pre-reproductive phase. The period of growth between the birth upto the reproductive maturity of an organism is called the juvenile phase. In plants, it is known as vegetative phase.

Reproductive phase
The period when organisms start producing offspring is called reproductive phase. On the basis of it, plant can be **monocarpic** (flower only once in their life cycle, *e.g.*, bamboo) or **polycarpic** (flower every year in a particular season, *e.g.*, apple).
On the basis of time of breeding, animals are of two types:
(i) **Seasonal breeders:** These animals reproduce at a particular period of the year such as frog, lizard etc.
(ii) **Continuous breeders:** These animals continue to breed throughout their sexual maturity *e.g.*, mice, cattle, etc.

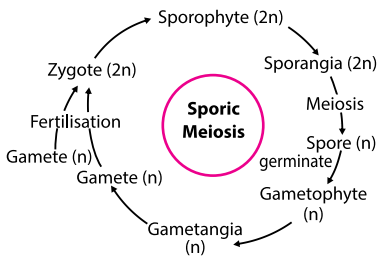
Senescent phase
It is the post-reproductive phase that begins from the end of the reproductive phase. The terminal irreversible stage of ageing is called senescence. It is the last phase of life span and ultimately leads to death.

EVENTS IN SEXUAL REPRODUCTION

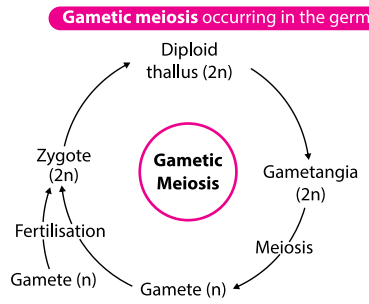
Pre-fertilisation events
These events of sexual reproduction take place before the fusion of gametes. These include :

Gametogenesis
It is the formation of gametes. Gametes can be **isogametes** (morphologically similar) or **heterogametes** (morphologically dissimilar). Gametes are formed as a result of meiosis which can be of three types:

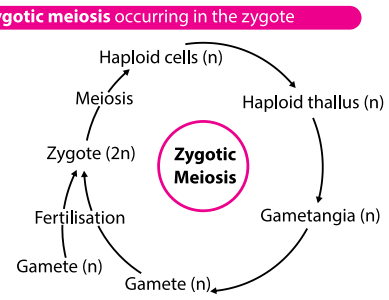
Sporic meiosis occurring inside the sporangia



Gametic meiosis occurring in the germinal cell



Zygotic meiosis occurring in the zygote



Gamete transfer
It is the transfer of gametes to bring them together for fertilisation. In algae, bryophytes and pteridophytes water serves as the medium. In flowering plants it is done by pollination. Animals have copulatory organs to transfer male gametes.

Fertilisation
It is the complete and permanent fusion of two gametes from different or same parent to form a diploid zygote (syngamy). It can be of two types.

External fertilisation
When fertilisation occurs outside the body of the organism, it is called external fertilisation or external syngamy. It requires an external medium such as water, *e.g.*, bony fish and amphibians.

Internal fertilisation
When egg is retained inside female body where it fuses with the male gamete, the process is called internal fertilisation or internal syngamy, *e.g.*, reptiles, birds, mammals etc.

Parthenogenesis
Development of egg (ovum) into a complete individual without fertilisation is known as parthenogenesis. It occurs in rotifers, arthropods, insects etc. It is of two types:

Natural
It occurs regularly in the life cycle of certain animals. It can be complete (occurs in animals which breed exclusively by parthenogenesis), incomplete (occurs in animals in which both sexual reproduction and parthenogenesis occur) and paedogenetic (occurs in larva).

Artificial
In this type, the ovum is induced to develop into a complete individual by artificial stimuli. The stimuli can be physical or chemical.

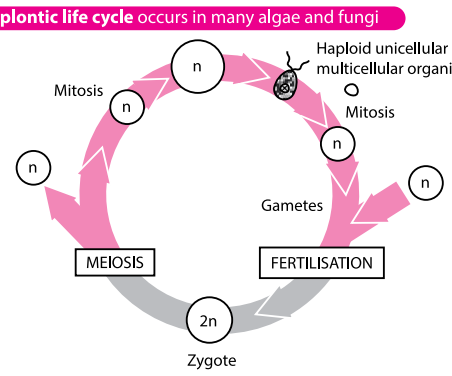
Neoteny
When the larva retains adult characters such as gonads and starts producing young ones by sexual reproduction, it is called neoteny. It occurs in axolotl larva.

Embryogenesis
During embryogenesis zygote undergoes mitotic cell division and cell differentiation. On the basis of development of zygote, animals can be **oviparous** (egg- laying; zygote develops outside the female body) *e.g.*, all birds, most reptiles etc., **viviparous** (zygote develops inside the female body) *e.g.*, mammals (except egg laying mammals) or **ovoviviparous** (retains egg inside; zygote development is internal) *e.g.*, sharks.
In flowering plants, zygote is formed inside the ovule.
After fertilisation the ripened ovary forms the fruit. The ovules mature and get converted into seeds. The ovary wall produces pericarp which protects the seeds.

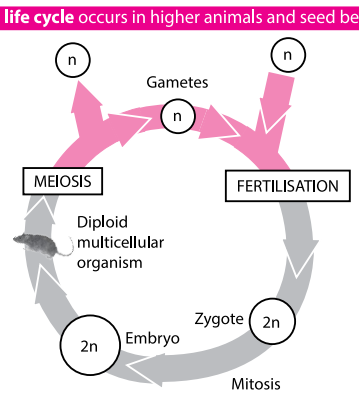
Post-fertilisation events
It includes development of zygote and embryogenesis.

Development of zygote
The zygote formed by fusion of two gametes is always diploid. It is a link between one generation and next generation. The development of zygote depends upon the type of life cycle of the organisms and environmental conditions. There are three types of life cycles:

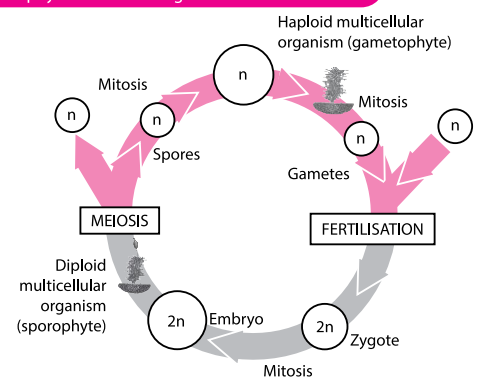
Haplontic life cycle occurs in many algae and fungi



Diplontic life cycle occurs in higher animals and seed bearing plants



Diplohaplontic life cycle occurs in bryophytes, pteridophytes and some algae.



SPECIAL MODES OF REPRODUCTION

56. Select the incorrect statement.
(a) LH and FSH decrease gradually during the follicular phase.
(b) LH triggers secretion of androgens from the Leydig cells.
(c) FSH stimulates the Sertoli cells which help in spermiogenesis.
(d) LH triggers ovulation in ovary.

57. Which of the following is a restriction endonuclease?
(a) DNase I (b) RNase
(c) *Hin*d II (d) Protease

58. Microtubules are the constituents of
(a) centrioles, spindle fibres and chromatin
(b) centrosome, nucleosome and centrioles
(c) cilia, flagella and peroxisomes
(d) spindle fibres, centrioles and cilia.

59. Select the correct statement.
(a) *Sequoia* is one of the tallest trees.
(b) The leaves of gymnosperms are not well adapted to extremes of climate.
(c) Gymnosperms are both homosporous and heterosporous.
(d) *Salvinia*, *Ginkgo* and *Pinus* all are gymnosperms.

60. In higher vertebrates, the immune system can distinguish self-cells and non-self. If this property is lost due to genetic abnormality and it attacks self-cells, then it leads to
(a) autoimmune disease (b) active immunity
(c) allergic response (d) graft rejection.

61. In a test cross involving F_1 dihybrid flies, more parental-type offspring were produced than the recombinant-type offspring. This indicates
(a) the two genes are linked and present on the same chromosome
(b) both of the characters are controlled by more than one gene
(c) the two genes are located on two different chromosomes
(d) chromosomes failed to separate during meiosis.

62. Which of the following statements is not correct?
(a) Pollen germination and pollen tube growth are regulated by chemical components of pollen interacting with those of the pistil.
(b) Some reptiles have also been reported as pollinators in some plant species.
(c) Pollen grains of many species can germinate on the stigma of a flower, but only one pollen tube of the same species grows into the style.
(d) Insects that consume pollen or nectar without bringing about pollination are called pollen/ nectar robbers.

63. Asthma may be attributed to
(a) inflammation of the trachea
(b) accumulation of fluid in the lungs
(c) bacterial infection of the lungs
(d) allergic reaction of the mast cells in the lungs.

64. In context of amniocentesis, which of the following statements is incorrect?
(a) It can be used for detection of Down's syndrome.
(b) It can be used for detection of cleft palate.
(c) It is usually done when a woman is between 14-16 weeks pregnant.
(d) It is used for prenatal sex determination.

65. Specialised epidermal cells surrounding the guard cells are called
(a) bulliform cells (b) lenticels
(c) complementary cells (d) subsidiary cells.

66. Which of the following is the most important cause of animals and plants being driven to extinction?
(a) Habitat loss and fragmentation
(b) Co-extinctions
(c) Over-exploitation
(d) Alien species invasion

67. Analogous structures are a result of
(a) shared ancestry (b) stabilising selection
(c) divergent evolution (d) convergent evolution.

68. Which of the following most appropriately describes haemophilia?
(a) Chromosomal disorder
(b) Dominant gene disorder
(c) Recessive gene disorder
(d) X-linked recessive gene disorder

69. Cotyledon of maize grain is called
(a) coleoptile (b) scutellum
(c) plumule (d) coleorhiza.

70. The term ecosystem was coined by
(a) E. Haeckel (b) E.Warming
(c) E.P. Odum (d) A. G. Tansley.

71. Which of the following features is not present in the Phylum Arthropoda?
(a) Parapodia (b) Jointed appendages
(c) Chitinous exoskeleton (d) Metameric segmentation

72. Which one of the following cell organelles is enclosed by a single membrane?
(a) Lysosomes (b) Nuclei
(c) Mitochondria (d) Chloroplasts

73. Which of the following is not a characteristic feature during mitosis in somatic cells?
(a) Chromosome movement
(b) Synapsis
(c) Spindle fibres
(d) Disappearance of nucleolus

74. A river with an inflow of domestic sewage rich in organic waste may result in
(a) an increased production of fish due to biodegradable nutrients
(b) death of fish due to lack of oxygen
(c) drying of the river very soon due to algal bloom
(d) increased population of aquatic food web organisms.

75. Which of the following is not required for any of the techniques of DNA fingerprinting available at present?
(a) Restriction enzymes
(b) DNA-DNA hybridisation
(c) Polymerase chain reaction
(d) Zinc finger analysis

76. In meiosis crossing over is initiated at
(a) zygotene (b) diplotene
(c) pachytene (d) leptotene.

77. Which one of the following statements is wrong?
(a) Eubacteria are also called false bacteria.
(b) Phycomycetes are also called algal fungi.
(c) Cyanobacteria are also called blue-green algae.
(d) Golden algae are also called desmids.

78. Blood pressure in the pulmonary artery is
(a) more than that in the pulmonary vein
(b) less than that in the venae cavae
(c) same as that in the aorta
(d) more than that in the carotid.

79. Which of the following statements is wrong for viroids?
(a) They cause infections.
(b) Their RNA is of high molecular weight.
(c) They lack a protein coat.
(d) They are smaller than viruses.

80. Photosensitive compound in human eye is made up of
(a) opsin and retinol
(b) transducin and retinene
(c) guanosine and retinol
(d) opsin and retinal.

81. One of the major components of cell wall of most fungi is
(a) cellulose (b) hemicellulose
(c) chitin (d) peptidoglycan.

82. Following are the two statements regarding the origin of life.
(A) The earliest organisms that appeared on the earth were non-green and presumably anaerobes.
(B) The first autotrophic organisms were the chemoautotrophs that never released oxygen.
Of the above statements which one of the following options is correct?
(a) Both (A) and (B) are correct.
(b) Both (A) and (B) are false.
(c) (A) is correct but (B) is false.
(d) (B) is correct but (A) is false.

83. Chrysophytes, Euglenoids, Dinoflagellates and Slime moulds are included in the kingdom.
(a) Fungi (b) Animalia
(c) Monera (d) Protista

84. Tricarpellary, syncarpous gynoecium is found in flowers of
(a) Fabaceae (b) Poaceae
(c) Liliaceae (d) Solanaceae.

85. A complex of ribosomes attached to a single strand of RNA is known as
(a) polypeptide (b) okazaki fragment
(c) polysome (d) polymer.

86. In the stomach, gastric acid is secreted by the
(a) peptic cells (b) acidic cells
(c) gastrin secreting cells (d) parietal cells.

87. Identify the correct statement on 'inhibin'.
(a) Is produced by granulosa cells in ovary and inhibits the secretion of LH
(b) Is produced by nurse cells in testes and inhibits the secretion of LH
(c) Inhibits the secretion of LH, FSH and prolactin
(d) Is produced by granulosa cells in ovary and inhibits the secretion of FSH

88. The standard petal of a papilionaceous corolla is also called
(a) vexillum (b) corona
(c) carina (d) pappus.

89. In bryophytes and pteridophytes, transport of male gametes requires
(a) birds (b) water
(c) wind (d) insects.

90. Proximal end of the filament of stamen is attached to the
(a) placenta (b) thalamus or petal
(c) anther (d) connective.

ANSWER KEY

1. (c)	**2.** (d)	**3.** (a)	**4.** (d)	**5.** (c)
6. (d)	**7.** (b)	**8.** (a)	**9.** (d)	**10.** (c)
11. (b)	**12.** (a)	**13.** (b)	**14.** (b)	**15.** (a)
16. (d)	**17.** (*)	**18.** (c)	**19.** (b)	**20.** (b)
21. (c)	**22.** (d)	**23.** (c)	**24.** (d)	**25.** (c)
26. (c)	**27.** (d)	**28.** (c)	**29.** (c)	**30.** (a)
31. (a)	**32.** (b)	**33.** (b)	**34.** (a)	**35.** (d)
36. (d)	**37.** (b)	**38.** (c)	**39.** (a)	**40.** (b)
41. (d)	**42.** (c)	**43.** (a)	**44.** (b)	**45.** (c)
46. (b)	**47.** (c)	**48.** (a)	**49.** (a)	**50.** (b)
51. (d)	**52.** (b)	**53.** (b)	**54.** (d)	**55.** (b)
56. (a)	**57.** (c)	**58.** (d)	**59.** (a)	**60.** (a)
61. (a)	**62.** (c)	**63.** (d)	**64.** (b)	**65.** (d)
66. (a)	**67.** (d)	**68.** (d)	**69.** (b)	**70.** (d)
71. (a)	**72.** (a)	**73.** (b)	**74.** (b)	**75.** (d)
76. (c)	**77.** (a)	**78.** (a)	**79.** (b)	**80.** (d)
81. (c)	**82.** (a)	**83.** (d)	**84.** (c)	**85.** (c)
86. (d)	**87.** (d)	**88.** (a)	**89.** (b)	**90.** (b)

*None of these

☺☺

BIO REPORTER

A BIZARRE SEA CREATURE - UNRAVELLED

Bizarre fish

A bizarre creature which looks like a "fish with legs" was discovered by Claudia Howse, Glenys Howse and James Beuvink in the Bay of Islands, of the coast of New Zealand's, North Island. The creature was sent to the Museum of New Zealand Te Papa Tongarewa in Wellington to get examined by the experts.

Initially, the museum described this creature as a fish with legs. This black, spiny animal has two fins on either side of its abdomen that look like two feet that could be used to walk along the bottom of the sea. Researchers have now confirmed that the specimen is a striated frogfish (*Antennarius striatus*) or anglerfish. Frogfish are found in most tropical and subtropical waters around the world, the primary exception being Mediterranean sea, and live anywhere between the shallows to 210 m below the surface of the ocean, with most animals found at depths of around 40 m. Frogfish are able to "walk" along and lurk on the seabed using their downward pointing pectoral fins. Despite their small stature, they are also pretty ferocious carnivores that have been known to be cannibals. They use a worm-like lure on their head to reel in their prey. Once in range they outwardly expand their mouths, allowing them to gobble up fish the same size as them.

According to researchers, the newly found striated frogfish is a bit different from rest as usually the species of frogfish have a characteristic stripy pattern whereas this new specimen is entirely black with only a trace of pattern on the shaft of the Illicium (stem of the lure). Frogfish are known for their ability to adjust their pigmentation to camouflage themselves against the ocean floor so scientists are speculating that the specimen has camouflaged to show black colour and is actually striated. The researchers are now performing further tests to find out more about this rare individual and investigating whether it might belong to a new species or subspecies.

PACKAGED AIR - BELIEVE IT OR NOT

Vitality air

Rapid industrialisation and amelioration in transport facilities have elevated the level of air pollution to alarming points, the consequences of which may be devastating. The effects of pollution are more adverse in hi-tech cities and countries where people are struggling to get fresh air and are suffering from various respiratory ailments and other diseases having their roots in pollution. Problem of air pollution has always been a concerning issue. Air in Beijing is so polluted that breathing it, does as much damage to the lungs as smoking 40 cigarettes a day. Around 4000 people die every day from smog in China.

In highly polluted countries like China, fresh air is a luxury. Realising the need and demand of fresh air, a Canada based company started selling fresh air in bottles under the brand name 'Vitality Air'. Vitality Air is sold across North America to India and Middle East. But China remains its biggest overseas market. The process of making Vitality Air is a labour intensive process because each bottle is filled with air by hand. The workers travel to rocky mountains in Canada to fill massive cans through clean compression, locking in the pure air without any contamination. A comprehensive check is done for safety after each can is filled. The air is filled with compression into handy bottles. Each bottle is equipped with innovative spray cap or a 2 in 1 built mask to make it user friendly. This packaged air is shipped around the world.

Packaged air comes in two flavours - Banff and Lake Louise. The bottles which contain "fresh clean air" have 78% nitrogen, 21% oxygen and a small amount of other gases whereas bottles containing "premium oxygen" have 95% oxygen and small amount of other gases. A 7.7 L bottle ranges around $32 Canadian dollar which is 50 times more expensive than a bottle of mineral water in China.

PRACTICE PAPER

CLASS XI & XII

PMT

SINGLE OPTION CORRECT

This paper contains 90 **multiple choice questions**. Each question has four choices (a), (b), (c) and (d), out of which **ONLY ONE** is correct. (Mark only One Choice).

Marks : 90 × 4 = 360 **Negative Marking (–1)**

1. How many organisms in the list given below are autotrophs?

Lactobacillus, Nostoc, Chara, Nitrosomonas, Nitrobacter, Streptomyces, Saccharomyces, Trypanosoma, Porphyra, Wolffia

(a) Four (b) Five
(c) Six (d) Three

2. All of the following statements concerning the actinomycetous filamentous soil bacterium *Frankia* are correct, except
(a) it can induce root nodules on some angiospermic plant species
(b) it cannot fix nitrogen in the free-living state.
(c) like *Rhizobium*, it usually infects its host plant through root hair deformation and stimulates cell proliferation in the host's cortex.
(d) it forms specialised vesicles, in which the nitrogenase is protected from oxygen by a chemical barrier involving triterpene hopanoids.

3. Myxomycetes are
(a) saprobes or parasites, having mycelia, asexual reproduction by fragmentation and sexual reproduction by fusion of gametes
(b) slimy mass of multinucleate protoplasm having pseudopodia like structures for engulfing food and reproduction through fragmentation
(c) prokaryotic organisms, cellular or acellular, saprobes or autotrophs and reproduce by binary fission
(d) eukaryotic, single celled or filamentous saprobes or autotrophs having asexual reproduction by division of haploid individuals and sexual reproduction by fusion of two cells or their nuclei.

4. Which one of the following matches is correct?

	Column-I	Column-II	Column-III
(a)	*Phytophthora*	Aseptate mycelium	Basidiomycetes
(b)	*Alternaria*	Sexual reproduction absent	Deuteromycetes
(c)	*Mucor*	Reproduction by conjugation	Ascomycetes
(d)	*Agaricus*	Parasitic fungus	Basidiomycetes

5. Which one is a true moss?
(a) Bog moss (b) Reindeer moss
(c) Club moss (d) Irish moss

6. Read the following statements (I-V) and answer the question which follows them.
I. In liverworts, mosses and ferns gametophytes are free-living.
II. Gymnosperms and some ferns are homosporous whereas some ferns are heterosporous.
III. Sexual reproduction in *Fucus*, *Volvox* and *Albugo* is oogamous.
IV. Sporophyte in liverworts is more elaborate than that of mosses.
V. Both, *Pinus* and *Marchantia* are dioecious

How many are true statements?
(a) Two (b) Three
(c) Four (d) Five

7. Which one of the following features is common in silver fish, scorpion, dragonfly and prawn?
(a) Three pairs of legs and segmented body
(b) Chitinous cuticle and two pairs of antennae
(c) Jointed appendages and chitinous exoskeleton
(d) Cephalothorax and tracheae

Contributed by : ***Harpal Singh***, Harpal's Biology Classes, Chandigarh, 09781124215

8. Which one of the following animals is correctly matched with its one characteristic and the taxon?

	Animal	Characteristic	Taxon
(a)	Millipede	Ventral nerve cord	Arachnida
(b)	Duck-billed platypus	Oviparous	Mammalia
(c)	Silver fish	Pectoral and pelvic fins	Chordate
(d)	Sea anemone	Triploblastic	Cnidaria

9. Match the following columns.

	Column-I	Column-II
A.	Diploblastic, radial symmetry and tissue level organisation	(i) *Wuchereria*
B.	Triploblastic, pseudo-coelomates and complete digestive system	(ii) *Dugesia*
C.	Bilateral symmetry, incomplete digestive system, organ and organ system level of organisation	(iii) *Cucumaria*
D.	Triploblastic, coelomate and radial symmetry	(iv) *Balanoglossus*
		(v) *Hydra*

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

10. The body of rohu fish is covered by
(a) cycloid scale, but the tail is homocercal
(b) placoid scale, but the tail is heterocercal
(c) cycloid scale, but the tail is heterocercal
(d) placoid scale, but the tail is homocercal.

11. Which of the following is not correct?
(a) In maize, roots arise from basal nodes of stem.
(b) In *Bryophyllum* roots arise from leaf.
(c) Carrot has napiform root.
(d) *Avicennia* has pneumatophores.

12. The leafless stem of onion, which is produced to bear flowers is called
(a) thalamus (b) scape
(c) spathe (d) involucres.

13. Match the following columns.

	Column-I	Column-II
A.	Aleurone layer	(i) Without fertilisation
B.	Parthenocarpic fruit	(ii) Nutrition
C.	Ovule	(iii) Double fertilisation
D.	Endosperm	(iv) Seed

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

14. Which one of the following statements is correct?
(a) Seeds of orchids have oil-rich endosperm.
(b) Placentation in Primrose is basal.
(c) Flower of tulip is a modified shoot.
(d) In tomato the fruit is a capsule.

15. The correct floral formula of chilli is
(a) ⊕ ♂♀ $K_{(5)}\overset{\frown}{C_{(5)}}\ A_5\underline{G}_{(2)}$ (b) ⊕ ♂♀ $K_{(5)}C_{(5)}\ A_{(5)}\underline{G}_2$
(c) ⊕ ♂♀ $K_5C_5\ A_{(5)}\underline{G}_2$ (d) ⊕ ♂♀ $K_{(5)}C_5\ A_5\ \underline{G}_2$

16. In which of the following plants amphivasal vascular bundles are found?
(a) *Yucca* and *Dracaena* (b) Ferns and *Yucca*
(c) *Dracaena* and Ferns (d) *Ficus* and *Yucca*

17. You are given a T.S. of dicot stem and a dicot root. Which of the following anatomical structures will you use to distinguish between the two?
(a) Secondary xylem (b) Secondary phloem
(c) Protoxylem (d) Cortical cells

18. Select the correctly matched pair.
(a) Chondroblast – Matrix secreting cells of cartilage
(b) Elastic cartilage – In pubic symphysis only
(c) Fibrous cartilage – Pinna of ear
(d) Hyaline cartilage – Intervertebral disc

19. Bowman's glands are found in
(a) olfactory epithelium (b) external auditory canal
(c) cortical nephrons only (d) juxtamedullary nephrons.

20. Smooth muscle fibres are
(a) cylindrical, unbranched, striated, multinucleate and voluntary
(b) spindle-shaped, unbranched, non-striated, uninucleate and involuntary
(c) cylindrical, unbranched, non-striated, multinucleate and involuntary
(d) spindle-shaped, unbranched, striated, uninucleate and voluntary.

21. Match the following columns.

	Column-I (WBC)	Column-II (Shape of nucleus)
A.	Neutrophils	(i) Kidney-shaped
B.	Eosinophils	(ii) S-shaped
C.	Basophils	(iii) 3-5 lobes
D.	Monocytes	(iv) 2 lobes
		(v) Disc-shaped

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

22. Which of the following cell organelles is non-membranous and found in both prokaryotic and eukaryotic cells?

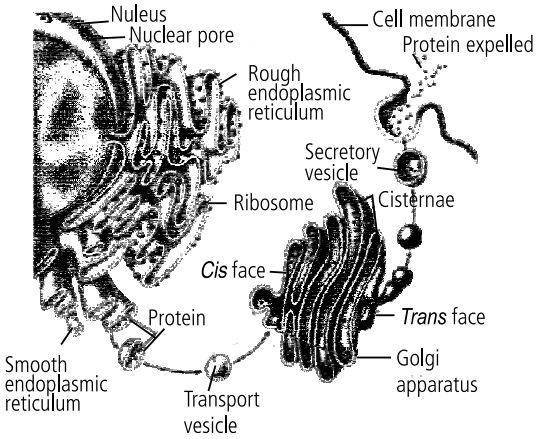
(a) Centriole (b) Microbodies
(c) Ribosomes (d) Vacuoles

23. Match the following columns.

Column-I	Column-II
A. Cech *et. al.*	(i) C. de Duve
B. Ribosomes	(ii) C. Benda
C. Lysosomes	(iii) Mass of calcium carbonate
D. Cystolith	(iv) Ribozyme
	(v) Protein synthesis

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

24. Which one of the following organelle in the figure correctly matches with its function?



(a) Golgi apparatus, protein synthesis
(b) Golgi apparatus, formation of glycoproteins
(c) Rough endoplasmic reticulum, lipid synthesis by SER and Golgi complex
(d) Rough endoplasmic reticulum, formation and secretion of enzymes by Golgi body

25. Match the following columns.

Column - I	Column - II
A. Carbonic anhydrase	(i) Sugar alcohol
B. Creatine phosphate	(ii) Non-reducing sugar
C. Mannitol	(iii) High energy phosphate
D. Sucrose	(iv) Reducing sugar
	(v) Red blood cells

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

26. Select the option which is not correct with respect to enzyme action.

(a) Substrate binds with enzyme at its active site.
(b) Enzyme changes the chemical equilibrium and speed of reaction.
(c) A non-competitive inhibitor binds the enzyme at a site distinct from that which binds the substrate.
(d) Malonate is a competitive inhibitor of succinic dehydrogenase.

27. The essential chemical components of many coenzymes are

(a) nucleic acids (b) carbohydrates
(c) vitamins (d) apoenzymes.

28. Match the following columns.

Column-I	Column-II
A. Aster formation	(i) Cancer
B. Cell cycle	(ii) Cell control
C. Malignant tumour	(iii) Programmed cell death
D. Apoptosis	(iv) Mitosis in animal cells
	(v) Growth and division

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

29. A somatic cell that has just completed the S-phase of its cell cycle, as compared to gamete of the same species has
(a) twice the number of chromosomes and twice the amount of DNA
(b) same number of chromosomes but twice the amount of DNA
(c) twice the number of chromosomes and four times the amount of DNA
(d) four times the number of chromosomes and twice the amount of DNA.

30. pH of phloem sap is
(a) 8.7-9.6 (b) 7.5-8.6
(c) 5.0-6.0 (d) 2.4-0.8.

31. Which of the following trees would die quicker?
(a) Hollow-heated (b) Girdled
(c) Deciduous (d) Prunned

32. Which one of the following is a macronutrient?
(a) Mg (b) Mo
(c) Mn (d) Zn

33. Match the element with its associated functions/roles and choose the correct option among given below.

	Column-I		**Column-II**
A.	Boron	(i)	Splitting of H_2O to liberate O_2 during photosynthesis
B.	Manganese	(ii)	Needed for synthesis of auxins
C.	Molybdenum	(iii)	Component of nitrogenase
D.	Zinc	(iv)	Pollen germination
E.	Iron	(v)	Component of ferredoxin

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

34. Functional unit of photosynthesis is known as
(a) electron (b) photon
(c) chlorophyll (d) LHC.

35. Match the following columns.

	Column-I		**Column-II**
A.	C_3-plants	(i)	Kranz anatomy
B.	Photolysis of water	(ii)	Alternative of C_4-pathway
C.	C_4-plants	(iii)	Fruits
D.	CAM	(iv)	Mustard
		(v)	Photochemical phase

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

36. Anoxygenic photosynthesis is characteristic of
(a) *Rhodospirillum* (b) *Spirogyra*
(c) *Chlamydomonas* (d) *Ulva.*

37. 'Plasticity' in plant growth means that
(a) plant roots are extensible
(b) plant development is dependent on the environment
(c) stems can extend
(d) none of these.

38. Match the following columns.

	Column-I		**Column-II**
A.	IAA	(i)	Gases
B.	6-furfurylamino-purine	(ii)	Terpenes
C.	ABA	(iii)	Derivatives of carotenoids
D.	GA_3	(iv)	Adenine derivatives
E.	C_2H_4	(v)	Indole compounds

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

39. Through their effect on plant growth regulators, what do the temperature and light control in the plants?
(a) Apical dominance (b) Flowering
(c) Closure of stomata (d) Fruit elongation

40. The pH in part of gut is 1.8, then which enzyme will digest protein?
(a) Trypsin (b) Pepsin
(c) Carboxypeptidase (d) Enterokinase

41. Match the following columns.

	Column-I		**Column-II**
A.	Sphincter of a internus	(i)	Opening of hepatopancreatic duct into duodenum
B.	Cardiac sphincter	(ii)	Between duodenum and posterior stomach
C.	Sphincter of Oddi	(iii)	Guarding the terminal part of alimentary canal
D.	Illeocaecal sphincter	(iv)	Between oesophagus and anterior stomach
E.	Pyloric sphincter	(v)	Between small intestine and bowel

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

42. If the thoracic wall, but not lungs, is punctured the
(a) lungs get inflated
(b) man dies as the lungs get collapsed
(c) breathing rate decreases
(d) breathing rate increases.

43. When the oxygen supply to the tissues is inadequate, the condition is
(a) hypoxia (b) asphyxia
(c) pleurisy (d) anoxia.

44. Which of the following cells do not exhibit phagocytotic activity?
(a) Monocytes (b) Neutrophils
(c) Basophils (d) Macrophages

45. Select the lymphoid organs from the given choices.
I. Lymph node II. Thymus gland
III. Red bone marrow IV. Liver
V. Spleen VI. Osteocytes
VII. Peyer's patches

The correct option with correct choices is
(a) I, II, III and IV (b) III, IV, V and VI
(c) IV, V, VI and VII (d) I, II, IV, V and VII.

46. Which blood clotting factor is not synthesised in Xmas disease?
(a) VIII (b) VII (c) IX (d) XIII

47. Match the following columns.

Column-I	Column-II
A. Pulmonary vein	(i) Three-chambered heart
B. Pulmonary artery	(ii) Deoxygenated blood
C. Amphibians	(iii) Venous heart
D. Fish	(iv) Four-chambered heart
	(v) Oxygenated blood

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

48. Blood pressure in the mammalian aorta is maximum during
(a) systole of the atrium
(b) diastole of the right ventricle
(c) systole of the left ventricle
(d) diastole of the left ventricle.

49. Which one of the following statements in regard to the excretion by the human is correct?
(a) Descending limb of loop of Henle is impermeable to water.
(b) Distal convoluted tubule is incapable of reabsorption HCO_3^-.
(c) Nearly 99% of the glomerular filtrate is reabsorbed by the renal tubules.
(d) Ascending limb of loop of Henle is impermeable to electrolytes.

50. Which of the following is both osmoregulator as well as nitrogenous excretory product?
(a) Ammonia (b) Urea
(c) Uric acid (d) All of these

51. Sliding filament theory can be best explained as
(a) when myofilaments slide pass each other, actin filaments shorten while myosin filament do not shorten
(b) actin and myosin filaments shorten and slide pass each other
(c) actin and myosin filaments do not shorten but rather slide pass each other
(d) when myofilament slide pass each other myosin filament shorten while actin filaments do not shorten.

52. Which one of the following is an example of negative feedback loop in humans?
(a) Constriction of skin, blood vessels and contraction of skeletal muscles, when it is too cold.
(b) Secretion of tears after falling of sand particles into the eye.
(c) Salivation of mouth at the site of delicious food.
(d) Secretion of sweat glands and construction of skin blood vessels, when it is too hot.

53. Parkinson's disease (characterised by tremors and progressive rigidity of limbs) is caused by degeneration of brain neurons that are involved in movement control and make use of neurotransmitter
(a) acetylcholine (b) norepinephrine
(c) dopamine (d) adrenaline.

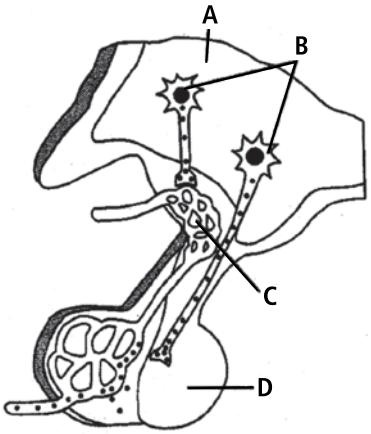
54. Which of the following is not involved in knee-jerk reflex?
(a) Muscle spindle (b) Motor neuron
(c) Brain (d) Inter neurons

55. Match the following columns.

Column-I	Column-II
A. Beta cells	(i) Lysozyme
B. Mast cells	(ii) Mucus
C. Paneth cells	(iii) Histamine
D. Acinar cells	(iv) Insulin
	(v) Pancreatic enzymes

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

56. Identify A to D in the given figure and choose correct answer.



(a) A-Hypothalamic neuron, B-Hypothalamus, C-Portal circulation, D-Posterior pituitary

(b) A-Hypothalamus, B-Hypothalamic neurons, C-Portal circulation, D-Posterior pituitary
(c) A-Hypothalamus, B-Hypothalamic neurons, C-Posterior pituitary, D-Portal circulation
(d) A-Hypothalamus, B-Hypothalamic neurons, C-Posterior pituitary, D-Neurohypophysis.

57. Match the following columns.

Column-I	Column-II
A. PRL	(i) Gonadotropins
B. TSH	(ii) Glucocorticoids
C. ACTH	(iii) Pituitary hormone
D. LH and FSH	(iv) Mammary glands

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

58. The pituitary gland is located in a bony cavity called _A_ and is attached to _B_ by a stalk. Identify A and B to complete the given statement.
(a) A-sella turcica; B-midbrain
(b) A-sella turcica; B-part of hindbrain
(c) A-sella turcica; B-hypothalamus
(d) A-sella turcica; B-pineal

59. Which one of the following is a modification of columnar epithelial cells?
(a) Goblet cells (b) Sertoli cells
(c) Leydig's cells (d) Lutein cells

60. The muscle fatigue occurs due to accumulation of
(a) CO_2 (b) lactic acid
(c) creatine phosphate (d) myosinease.

61. Correct order of action of hydrophilic hormones
I. Hormones bind to plasma membrane
II. Physiological response
III. Biochemical response
IV. Generation of secondary messenger

Choose the correct option.
(a) I, II, III, IV (b) II, I, III, IV
(c) I, IV, III, II (d) III, I, II, IV

62. Male and female flowers are present on different plants to ensure xenogamy in
(a) papaya (b) bottle gourd
(c) maize (d) all of these.

63. Given below are the events that are observed in an artificial hybridisation programme. Arrange them in the correct sequential order and select the correct option.
1. Re-bagging
2. Selection of parents
3. Bagging
4. Dusting the pollen on stigma
5. Emasculation
6. Collection of pollen from male parent

(a) $2 \rightarrow 3 \rightarrow 5 \rightarrow 6 \rightarrow 4 \rightarrow 1$
(b) $2 \rightarrow 5 \rightarrow 3 \rightarrow 6 \rightarrow 4 \rightarrow 1$
(c) $5 \rightarrow 2 \rightarrow 3 \rightarrow 6 \rightarrow 1 \rightarrow 4$
(d) $2 \rightarrow 3 \rightarrow 6 \rightarrow 4 \rightarrow 5 \rightarrow 1$

64. From among the situations given below, choose the one that prevents both autogamy and geitonogamy.
(a) Monoecious plant bearing unisexual flowers
(b) Dioecious plant bearing only male or female flowers
(c) Monoecious plant with bisexual flowers
(d) Dioecious plant with bisexual flowers

65. Below is given the unorganised list of some important events in the human female reproductive cycle. Identify the correct sequence of these events and select the correct option.
(i) Secretion of FSH
(ii) Growth of corpus luteum
(iii) Growth of the follicle and oogenesis
(iv) Ovulation
(v) Sudden increase in the levels of LH
(a) (i) $\rightarrow$ (iv) $\rightarrow$ (iii) $\rightarrow$ (v) $\rightarrow$ (ii)
(b) (ii) $\rightarrow$ (i) $\rightarrow$ (iii) $\rightarrow$ (iv) $\rightarrow$ (v)
(c) (iii) $\rightarrow$ (i) $\rightarrow$ (iv) $\rightarrow$ (ii) $\rightarrow$ (v)
(d) (i) $\rightarrow$ (iii) $\rightarrow$ (v) $\rightarrow$ (iv) $\rightarrow$ (ii)

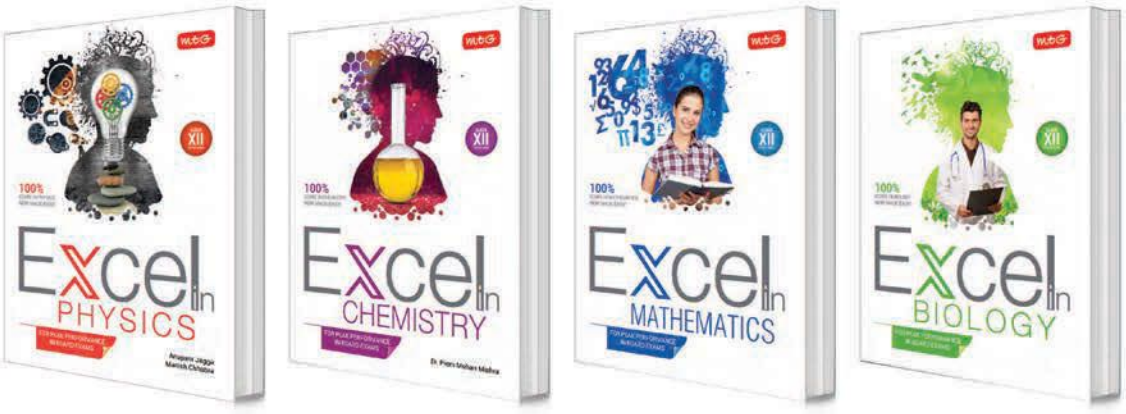
66. Which of the following are the drawbacks of the IUDs?
(i) Their spontaneous expulsion, even without the woman's knowledge.
(ii) They can cause excess menstrual bleeding and pain.
(iii) Risk of perforation of uterus.
(iv) Risk of infection.
(v) They increase the phagocytosis of sperms.
(a) (i), (iii) and (v) (b) (i), (ii), (iv) and (vi)
(c) (i), (ii), (iii) and (v) (d) (i), (ii), (iii) and (iv)

67. Mark the wrong item in each series and select the correct option.
(i) Spermatocyte; polar body; spermatid; spermatogonium
(ii) Endometrium; corpus luteum; acrosome; Graafian follicle
(iii) Vas deferens; Fallopian tube; epididymis; Cowper's gland
(iv) Testes; prostate; seminal vesicle; Cowper's gland

	(i)	(ii)	(iii)	(iv)
(a)	Spermatid	Endometrium	Epididymis	Prostate
(b)	Polar body	Acrosome	Fallopian tube	Testes
(c)	Spermatocyte	Corpus luteum	Vas deferens	Cowper's gland
(d)	Spermatogonium	Graafian follicle	Cowper's gland	Seminal vesicles

68. Select the correct statements regarding the process of transcription or processing of RNA in eukaryotes.
(i) The strand of dsDNA which takes part in transcription process is called as coding strand.

Concerned about your performance in Class XII Boards?



₹ 475 ₹ 475 ₹ 500 ₹ 400

Well, fear no more, help is at hand.....

To excel, studying in right direction is more important than studying hard. Which is why we created the Excel Series. These books – for Physics, Chemistry, Biology & Mathematics – have been put together totally keeping in mind the prescribed syllabus and the pattern of CBSE's Board examinations, so that students prepare and practice with just the right study material to excel in board exams.

Did you know nearly all questions in CBSE's 2016 Board Examination were a part of our Excel books? That too fully solved !

HIGHLIGHTS:

- Comprehensive theory strictly based on NCERT, complemented with illustrations, activities and solutions of NCERT questions
- Practice questions & Model Test Papers for Board Exams
- Value based questions
- Previous years' CBSE Board Examination Papers (Solved)
- CBSE Board Papers 2016 Included

Scan now with your smartphone or tablet

Visit **www.mtg.in** for latest offers and to buy online!

mtG Learning Media

Available at all leading book shops throughout the country.
For more information or for help in placing your order:
Call 0124-6601200 or email: info@mtg.in
**Application to read QR codes required*

(ii) The enzyme RNA polymerase can catalyse polymerisation only in one direction *i.e.*, 5′ → 3′.
(iii) An unusual nucleotide methyl guanosine triphosphate added at 5′.
(iv) During tailing process, adenylate residues (200-300) are added at 3′ end in a template independent manner.
(a) (i) and (ii) (b) (iii) and (iv)
(c) (ii), (iii) and (iv) (d) All are correct

69. Sickle cell anaemia results from a single base substitution in a gene, thus it is an example of
(a) point mutation (b) transversion
(c) silent mutation (d) both (a) and (b).

70. Arrange the various steps of DNA fingerprinting technique in the correct order.
(i) Separation of DNA fragments by electrophoresis
(ii) Digestion of DNA by restriction endonucleases
(iii) Hybridisation using labelled VNTR probe
(iv) Isolation of DNA
(v) Detection of hybridised DNA fragments by auto radiography
(vi) Transferring the separated DNA fragments to nitrocellulose membrane
(a) (iv) → (ii) → (i) → (vi) → (iii) → (v)
(b) (iv) → (i) → (ii) → (iii) → (vi) → (v)
(c) (ii) → (i) → (iv) → (vi) → (iii) → (v)
(d) (iii) → (v) → (iv) → (ii) → (i) → (vi)

71. In sickle cell anaemia glutamic acid is replaced by valine. Which one of the following triplets codes for valine?
(a) G G G (b) A A G
(c) G A G (d) G U G

72. In the F_2 generation of a Mendelian dihybrid cross the number of phenotypes and genotypes are
(a) phenotypes-4; genotypes-16
(b) phenotypes-9; genotypes-4
(c) phenotypes-4; genotypes-8
(d) phenotypes-4; genotypes-9.

73. Match column-I containing transgenic organisms with their specific characteristics in column-II and select the correct answer from the codes given below.

	Column-I		**Column-II**
A.	Golden rice	(i)	Protein-enriched milk
B.	Bt cotton	(ii)	Increased shelf life
C.	Flavr Savr	(iii)	Enriched with vitamin A
D.	Rosie cow	(iv)	High yield and pest resistant

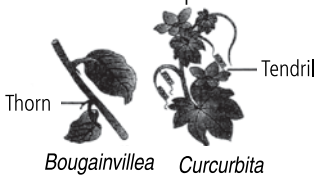
(a) A-(iii), B-(iv), C-(ii), D-(i)
(b) A-(iii), B-(ii), C-(iv), D-(i)
(c) A-(ii), B-(iv), C-(iii), D-(i)
(d) A-(i), B-(iv), C-(ii), D-(iii)

74. The correct sequence of making a cell competent is
(a) treatment with divalent cations → incubation of cells with recombinant DNA on ice → heat shock (42°C) → placing on ice
(b) heat shock (42°C) → incubation of cells with recombinant DNA on ice → treatment with divalent cations → placing on ice
(c) treatment with divalent cations → placing on ice → incubation of cells with recombinant DNA on ice → heat shock (42°C)
(d) incubation of cells with recombinant DNA on ice → heat shock (42°C) → treatment with divalent cations → placing on ice.

75. Which of the following statements is incorrect?
(a) Jawless fish probably evolved around 350 mya.
(b) *Tyrannosaurus rex* was biggest dinosaur, about 20 feet in height and had huge fearsome dagger like teeth.
(c) About 15 mya, primates called *Dryopithecus* and *Ramapithecus* existed.
(d) *Australopithecus* with a brain size of 1400 cc lived in east and central Asia between 100000-40000 years back.

76. Which of the following statements about natural selection are correct?
(i) It tends to increase the characters that enhance survival and reproduction.
(ii) It causes adaptation.
(iii) It acts on an organism's phenotype.
(iv) It was considered as mechanism of evolution by Darwin.
(a) (i), (ii), (iii) and (iv) (b) (i) and (ii)
(c) (iii) and (iv) (d) (i), (iii) and (iv)

77. The given figure shows an example of



(a) homologous organs (b) convergent evolution
(c) divergent evolution (d) both (a) and (c).

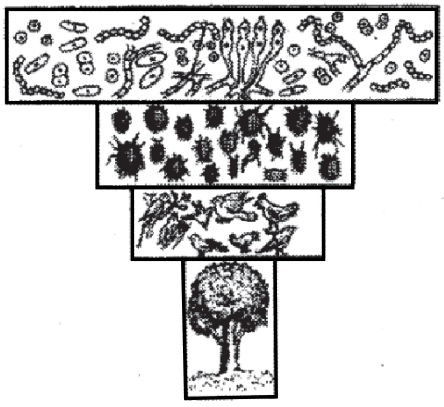
78. World's most problematic aquatic weed is
(a) *Parthenium* (b) *Wolffia*
(c) *Eichhornia* (d) *Trapa*.

79. Read the following statements carefully and select the incorrect ones.
(i) Development of the fertile top-soil takes centuries, but it can be easily removed due to human activities such as over-cultivation, unrestricted grazing etc.
(ii) Waterlogging results in soil salinity.
(iii) UV rays are essential for production as well as degradation of ozone gas.
(iv) Ozone present in troposphere acts as a shield absorbing UV radiations coming from the sun.
(v) Global warming can be controlled by increasing the use of fossil fuels.
(a) (i), (iii) and (v) (b) (iii), (iv) and (v)
(c) (iv) and (v) (d) (i), (ii) and (iii)

80. Read the following statements carefully.
(i) An electrostatic precipitator removes particulate matter by imposing negative charge on them.
(ii) Catalytic converters convert unburnt hydrocarbons into CO_2 and water.
(iii) Peroxyacyl nitrates (PAN) is a secondary pollutant.
(iv) DDT is a non-biodegradable pollutant.
Which of the above statements are incorrect?
(a) (i) and (ii) (b) (iii) and (iv)
(c) (i) and (iii) (d) None of these

81. Biosphere reserves differ from National Parks and Wildlife Sanctuaries because in the former
(a) human beings are not allowed to enter
(b) people are an integral part of the system
(c) plants are paid greater attention than the animals
(d) living organisms are brought from all over the world and preserved for posterity.

82. Which kind of pyramid is represented by the given figure?



(a) Inverted pyramid of numbers
(b) Inverted pyramid of biomass
(c) Inverted pyramid of energy
(d) Both (a) and (b)

83. Percentage of photosynthetically active radiation (PAR) that is captured by plants in synthesis of organic matter is about
(a) 50-70% (b) 1-5%
(c) 80-100% (d) 2-10%.

84. Study the following statements concerning food chains and select the correct ones.
(i) Removal of 80% tigers from an area resulted in greatly increased growth of vegetation.
(ii) Removal of most of the carnivores resulted in an increased population of deers.
(iii) The length of food chains is generally limited to 3-4 trophic levels due to Lindman's law.
(iv) The length of food chains may vary from 2 to 8 trophic levels.
(a) (i), (ii) and (iii) (b) (ii) and (iii)
(c) (i) and (iv) (d) (iii) and (iv)

85. Which of the following statements regarding the disease typhoid is/are correct?
(i) *Salmonella typhi* are the pathogenic protozoan which enter human intestine through contaminated food and water and migrate to other organs through blood.
(ii) Sustained high fever (39°C to 40°C), weakness, stomach pain, constipation, headache and loss of appetite are some common symptoms of typhoid.
(iii) Typhoid vaccine is available as DPT vaccine.
(iv) The patient of this disease is not required to be treated with antibiotics.
(a) (ii) only (b) (iii) and (iv)
(c) (i) and (ii) (d) (i), (ii) and (iii)

86. An auto-immune disease is
(a) SCID (b) rheumatoid arthritis
(c) myasthenia gravis (d) both (b) and (c).

87. Read the following statements regarding the various techniques used in cancer detection.
(i) Cancer detection is based on biopsy and histopathological studies of the tissue and blood and bone marrow tests for increased cell counts in case of leukaemia.
(ii) In biopsy, a piece of the suspected tissue cut into thin sections is stained and examined under microscope by a pathologist.
(iii) Techniques like radiography (use of X-rays), CT (computed tomography) and MRI (magnetic resonance imaging) are very useful to detect cancers of the internal organs.
(iv) Computed tomography uses strong magnetic fields and non-ionising radiations to detect physiological changes in living tissues.

(v) MRI uses X-rays and IR rays to generate a 3-D image of the internal structure of an object.

Which of the above statements are incorrect?

(a) (i) and (iii) (b) (ii) and (iv)
(c) (iii) and (iv) (d) (iv) and (v)

88. A wheat variety, Atlas 66, which has been used as a donor for improving cultivated wheat is rich in

(a) iron (b) carbohydrates
(c) proteins (d) vitamins.

89. Match column-I with column-II and select the correct answer from the codes given below.

Column-I		Column-II	
A.	*Azolla*	(i)	Symbiotic N_2-fixer
B.	Rotenone	(ii)	Symbiotic association with N_2-fixing cyanobacteria
C.	*Crotolaria juncea*	(iii)	Natural insecticide
D.	*Frankia*	(iv)	Green manure

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

90. *Baculoviruses (Nucleopolyhedrovirus)* do not show

(a) host specificity
(b) narrow spectrum applications
(c) effects on non-target pathogens
(d) utility in IPM programme.

ANSWER KEY

1.	(c)	**2.**	(b)	**3.**	(b)	**4.**	(b)	**5.**	(a)
6.	(a)	**7.**	(c)	**8.**	(b)	**9.**	(d)	**10.**	(a)
11.	(c)	**12.**	(b)	**13.**	(b)	**14.**	(c)	**15.**	(a)
16.	(a)	**17.**	(c)	**18.**	(a)	**19.**	(a)	**20.**	(b)
21.	(d)	**22.**	(c)	**23.**	(d)	**24.**	(b)	**25.**	(a)
26.	(b)	**27.**	(c)	**28.**	(b)	**29.**	(c)	**30.**	(b)
31.	(b)	**32.**	(a)	**33.**	(b)	**34.**	(d)	**35.**	(a)
36.	(a)	**37.**	(b)	**38.**	(b)	**39.**	(b)	**40.**	(b)
41.	(c)	**42.**	(b)	**43.**	(a)	**44.**	(c)	**45.**	(d)
46.	(c)	**47.**	(a)	**48.**	(c)	**49.**	(c)	**50.**	(b)
51.	(c)	**52.**	(a)	**53.**	(c)	**54.**	(c)	**55.**	(c)
56.	(b)	**57.**	(c)	**58.**	(c)	**59.**	(a)	**60.**	(b)
61.	(c)	**62.**	(a)	**63.**	(b)	**64.**	(b)	**65.**	(d)
66.	(d)	**67.**	(b)	**68.**	(c)	**69.**	(d)	**70.**	(a)
71.	(d)	**72.**	(d)	**73.**	(a)	**74.**	(a)	**75.**	(d)
76.	(a)	**77.**	(d)	**78.**	(c)	**79.**	(c)	**80.**	(d)
81.	(b)	**82.**	(a)	**83.**	(d)	**84.**	(b)	**85.**	(a)
86.	(d)	**87.**	(d)	**88.**	(c)	**89.**	(a)	**90.**	(c)

☺☺

UNSCRAMBLE ME

Unscramble the letters using the given clues.

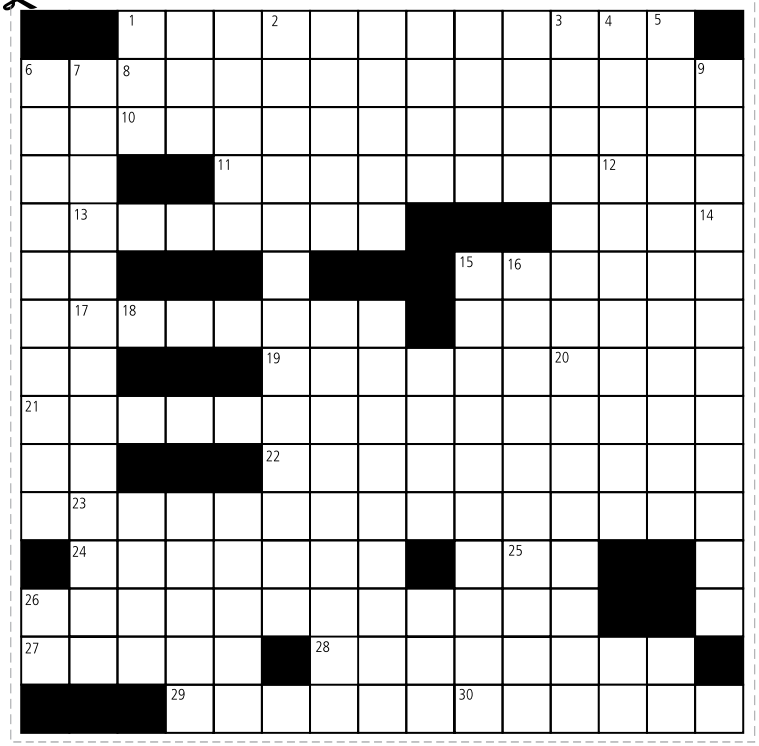
	Scrambled letters	Clues	Words
1.	BTRCHEOYOTMS	A minute rounded or oval disc-shaped non-nucleated fragments of the cells found in mammalian blood which prevent blood loss.	.....
2.	AYBHRCACTYYDL	An inherited disorder in human beings which is marked by abnormal short fingers and toes.	.....
3.	AMORPMGHMAY	A radiographic examination of breasts to detect cancer.	.....
4.	RPEYHTMRU	An insecticide which is obtained from the inflorescence of *Chrysanthemum*.	.....
5.	SLUCEONI	A polysaccharide found as reserve food material in diatoms.	.....
6.	NCOALROCGIY	Study of Crustaceans.	.....
7.	PTSMYECOHRER	An instrument used for measuring humidity and transpiration in plants.	.....
8.	LUGID	A group of species within a community that exploit the same resources in a similar way.	.....
9.	CEEISS	Establishment of organisms in an area into which they have come by dispersal or migration.	.....
10.	LIVLIKNIIN	A hormone secreted by the epithelium of entire small intestine which accelerates the movement of villi.	.....

Readers can send their responses at editor@mtg.in or post us with complete address by 25th of every month to win exciting prizes. Winners' names will be published in next issue.

CROSS WORD

Readers can send their responses at editor@mtg.in or post us with complete address by 25th of every month to win exciting prizes. Winners' names will be published in next issue.

Cut Here



ACROSS

1. An organism whose internal environment is highly influenced by external factors. (9)

8. A kind of life cycle in plants characterised by dominant gametophyte and diploid sporophytic generation is represented only by the one-celled zygote. (9)

10. The terminal stage of mitosis characterised by reappearance of nuclear envelope and disappearance of spindle fibres. (9)

11. An enzyme which is employed for chill proofing of beverages, degumming of silk, cleaning of hides etc. (8)

13. The products of fermentation activity of yeast *Monascus purpureus* which resemble mevalovate and are used in lowering blood cholesterol. (7)

18. An oxygen containing derivative of carotene which gives yellowish colour to autumn foliage. (6)

19. The structural and functional unit of kidney. (7)

21. A type of parthenogenesis in which only females are produced. (9)

22. The discoverer of tricarboxylic acid cycle of aerobic respiration. (5)

23. A juvenile hormone secreted by paired glands corpora allata present behind the insect brain. (8)

24. The step of gel electrophoresis in which the separated bands of DNA are cut out from agarose gel and extracted from the gel piece. (7)

26. A sex-linked trait which is inherited only by the male line *i.e.*, from father to son. (9)

27. Short, minute hairlike structures present on the surface of many cells, notably in certain protozoans and some types of vertebrate epithelium. (5)

28. A cytotoxic protein occurring in the lytic granules of cytotoxic T cells. (8)

29. The period of Palaeozoic era in which origin of jawed fishes and wingless insects occurred. (8)

30. The upper lobed part of angiospermic male reproductive organ which contains pollen sacs with numerous pollen grains. (6)

DOWN

2. The hypothetical plant hormone which induces flower formation. (8)

3. A rounded, flat, sesamoid bone formed by ossification in the tendon of quadriceps femoris muscle. (7)

4. The opaque or dark fog having condensed water vapours, dust, smoke and gases such as SO_2, H_2S, NO_2 etc. (4)

5. The phenomenon in which male gametes are brought to the female gametophyte containing egg by a pollen tube. (11)

6. The receptor which responds to the stimuli responsible for the sensation of pain. (10)

7. The liquid part of blood (excluding blood cells) consisting of various inorganic salts of Na,K,Ca, etc, high concentration of proteins and variety of trace substances. (6)

9. A cylinder of tissue, chiefly parenchymatous, lying centrally in plant stems surrounded by vascular tissue. (4)

12. The stage in the development of an animal embryo that succeeds the blastula and begins with the production of the primary germ layers. (8)

14. A type of hybrid cell that is produced by the fusion of a myeloma cell with a normal antibody producing B cell. (9)

15. The series of developmental stages of biotic succession in an arid area. (8)

16. The body part of tapeworm which possesses suckers and hooks as organs of attachment. (6)

17. A single seeded, dry, indehiscent fruit formed from a single carpel having superior unilocular uniovuled ovary where pericarp is free from seed except at one point. (6)

20. The disease in honey bees caused by a microbe *Nosema apis*. (6)

25. A nucleotide sequence in a gene that codes for part or all of the gene product and is therefore expressed in mature *m*RNA. (4)

☺☺

Contd. from page no. 30

Intrauterine Contraceptive Devices (IUCDs)

- IUCDs are plastic or metal objects inserted by doctors in the uterus or vagina. They increase phagocytosis of sperms within the uterus.

Intrauterine Contraceptive Devices (IUCDs)

Non-medicated IUCDs
e.g., Lippes loop

Hormone releasing IUCDs
e.g., LNG-20, progestasert
The hormone releasing IUCDs make the uterus unsuitable for implantation and the cervix hostile to the sperms.

Copper releasing IUCDs
e.g., CuT, Cu7, Multiload 375 released Cu ions suppress sperm motility and fertilisation capacity of the sperms.

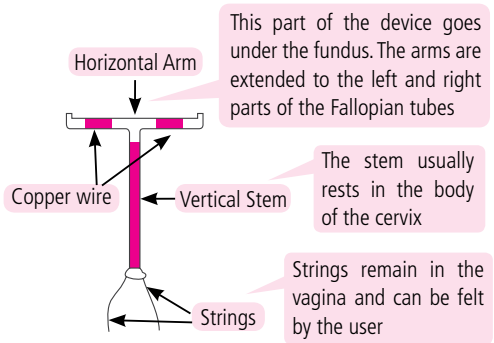


Fig.: CuT

Disadvantages of IUCDs

- IUCDs are expelled without the knowledge of the wearer in about 10 to 15 % of the women and they run the risk of becoming pregnant.
- Risk of perforation of uterus and also risk of infection is there.
- They can cause excessive menstrual bleeding and pain.

Oral contraceptive pills

- These contraceptives are taken in the form of tablets.

Oral contraceptive pills

Combined pills
They contain synthetic progesterone and oestrogen to check ovulation, *e.g.*, Mala D and Mala N.

Mini pills
They contain progestin only (with no oestrogen) *e.g.*, Saheli.

Oral hormonal pills act in four ways:

- Inhibition of ovulation
- Impairing cervix's ability to allow sperm passage
- Inhibition of motility and secretory actions of oviducts
- Alteration of uterine endometrium making it unsuitable for implantation

- Oral contraceptive pills increase the **risk of intravascular clotting.** Therefore, they are not recommended for women with a history of disorders of blood clotting, cerebral blood vessel damage, hypertension, heart diseases, etc.
- They can also cause acne, weight gain, depression, hypertension, leukorrhea, reduction in menstrual flow, mastalgia (breast tenderness), nausea, vomiting, melasma (facial skin discolouration), etc. But these effects are not strongly associated with low dose formulations.

Oral pills affect brain

- In a recent study, brain morphology of men, women using oral pills and naturally cycling women (not on pills) were studied. Males were found to have larger areas of gray matter in parahippocampal gyrus and hippocampus (associated with learning and memory) and amygdala (associated with emotional regulation).
- Surprisingly, women using oral pills also showed larger gray matter in these areas *versus* naturally cycling women.
- Thus, oral pills can change brain structure. This is a cause of concern, even if the changes seem benign for the moment.

Saheli - The non-hormonal pill

- Central Drug Research Institute (CDRI), Lucknow introduced in 1991, world's first non-steroidal oral contraceptive pills under the brand name '**Saheli**' (initial thrice a week for three months and later once a week dosage). It contains '**centchroman**' which inhibits implantation.
- For being non-steroidal, it does not have side effects like nausea, vomiting, weight gain, etc. The only side effect known is delayed menstrual cycle in around 8% women. Thus, it is safe for long term use. It is also found beneficial for treating dysfunctional uterine bleeding, osteoporosis and premenstrual syndrome and as a drug for lower lipid levels in the blood.

Subcutaneous implants (Norplant)

- A new contraception method is subcutaneous (under the skin) implantation of synthetic progesterone.
- It acts similarly to oral contraceptives by blocking ovulation and thickening the cervical mucus to prevent sperm transport.
- Six matchstick-sized capsules containing the steroid are inserted under the skin of the inner arm above the elbow.
- The capsules slowly release the synthetic progesterone for about five years.
- It is very safe, convenient, effective, and **long-lasting (5 years).**

Morning after pills

- Implantation can also be checked by so-called 'morning after' pills, also known as **emergency contraceptives.**
- These pills can prevent pregnancy when taken within 72 hours after unprotected sexual intercourse.
- They can either suppress ovulation or prevent fertilisation and implantation. These kits are for emergency use only. They should not be used as a substitute for ongoing contraceptive methods.

Hormone injections (Depo-Provera)

- These are progesterone derivative injections which are given once every three months, that release a hormone slowly and prevent ovulation.
- **Depot medroxyprogesterone acetate (DMPA) and Norethisterone enanthate (NET-EN);** are two injectable hormonal contraceptives.
- They are convenient and highly effective with no serious side effects. There is occasional heavy menstrual bleeding.

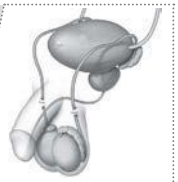
Permanent methods

- These include sterilisation (surgical methods). Surgical methods block gamete transport and prevent fertilisation.

Permanent methods

Vasectomy

- Sterilisation procedure in males.
- A small part of the vas deferens is removed or tied up through a small cut on the scrotum.



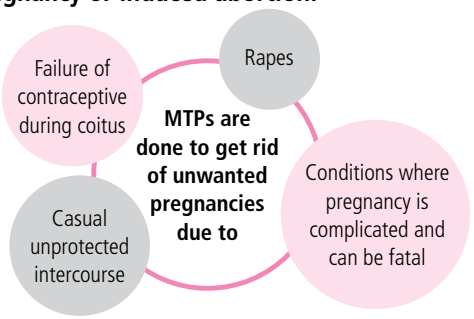
Tubectomy

- Sterilisation procedure in females.
- A small part of the Fallopian tube is removed or tied up through a small cut in the abdomen or through vagina.

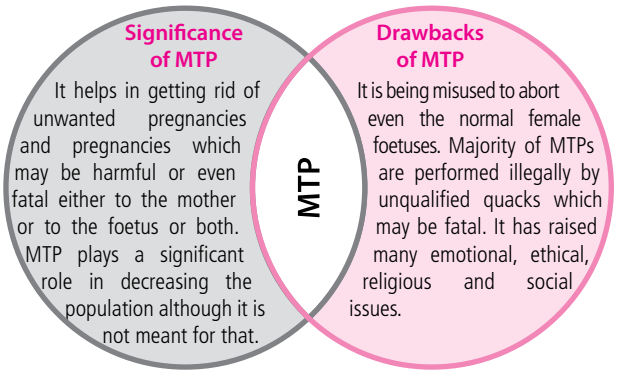
- Both vasectomy and tubectomy are very effective but **reversibility is very poor.**
- In latest method, the Fallopian tubes are folded and ringed by synthetic rings with the help of an instrument called **laproscope**.

MEDICAL TERMINATION OF PREGNANCY (MTP) OR INDUCED ABORTION

- Intentional or voluntary termination of pregnancy before the foetus becomes viable is called **medical termination of pregnancy or induced abortion.**



- MTPs are considered safe during the first trimester of pregnancy (*i.e.*, upto 12 weeks of pregnancy).
- **Government of India legalised MTPs in 1971.**
- A pregnancy can be legally terminated in its early stages if doctors advise that its continuation would seriously affect the health of the mother, such MTP is termed **therapeutic**.
- At present, termination is legally allowed up to 28th week of pregnancy if the family physician and the gynaecologist consider the need for abortion.



INTEXT PRACTICE QUESTIONS

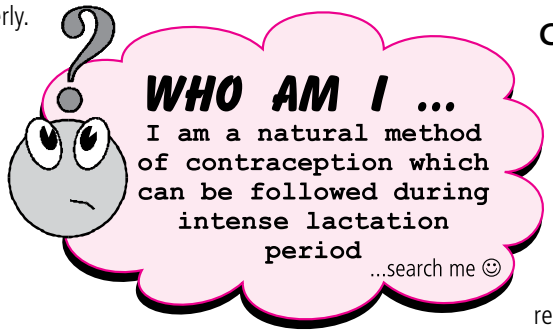
1. Why is periodic abstinence method not a 100% safe method of birth control?
2. (a) What is a reproductively healthy society?
   (b) Do you think that reproductive health in our country has improved in the past few years? If yes, mention any two areas of improvement.

SEXUALLY TRANSMITTED DISEASES (STDs)

- Diseases or infections which are transmitted through sexual intercourse with infected persons are collectively called **sexually transmitted diseases (STDs) or venereal diseases (VD) or reproductive tract infections (RTI).**
- Early symptoms of most of the STDs are itching, fluid discharge, swelling, slight pain, etc., in the genital region.
- Except HIV infection, Hepatitis - B and genital herpes, all other STDs are completely curable if detected early and treated properly.
- STDs are usually caused by bacteria, viruses, chlamydia, protozoans, nematodes, ectoparasites and fungi.
- If proper and timely treatment is not given it may lead to complications such as pelvic inflammatory diseases (PID), abortions, stillbirths, ectopic pregnancies, infertility or even cancer of reproductive tract.

Prevention of STDs

- To prevent STDs one should
  - avoid sex with unknown partner/multiple partners.
  - always use condoms during intercourse.
  - consult a qualified doctor if some symptoms appear. If STD is detected one should get complete treatment.



Confirmation tests for STDs

- These include : Culture and microscopic observation with specific staining, detection of specific antigen/antibody using ELISA like technique, DNA hybridisation, polymerase chain reaction (PCR), etc.

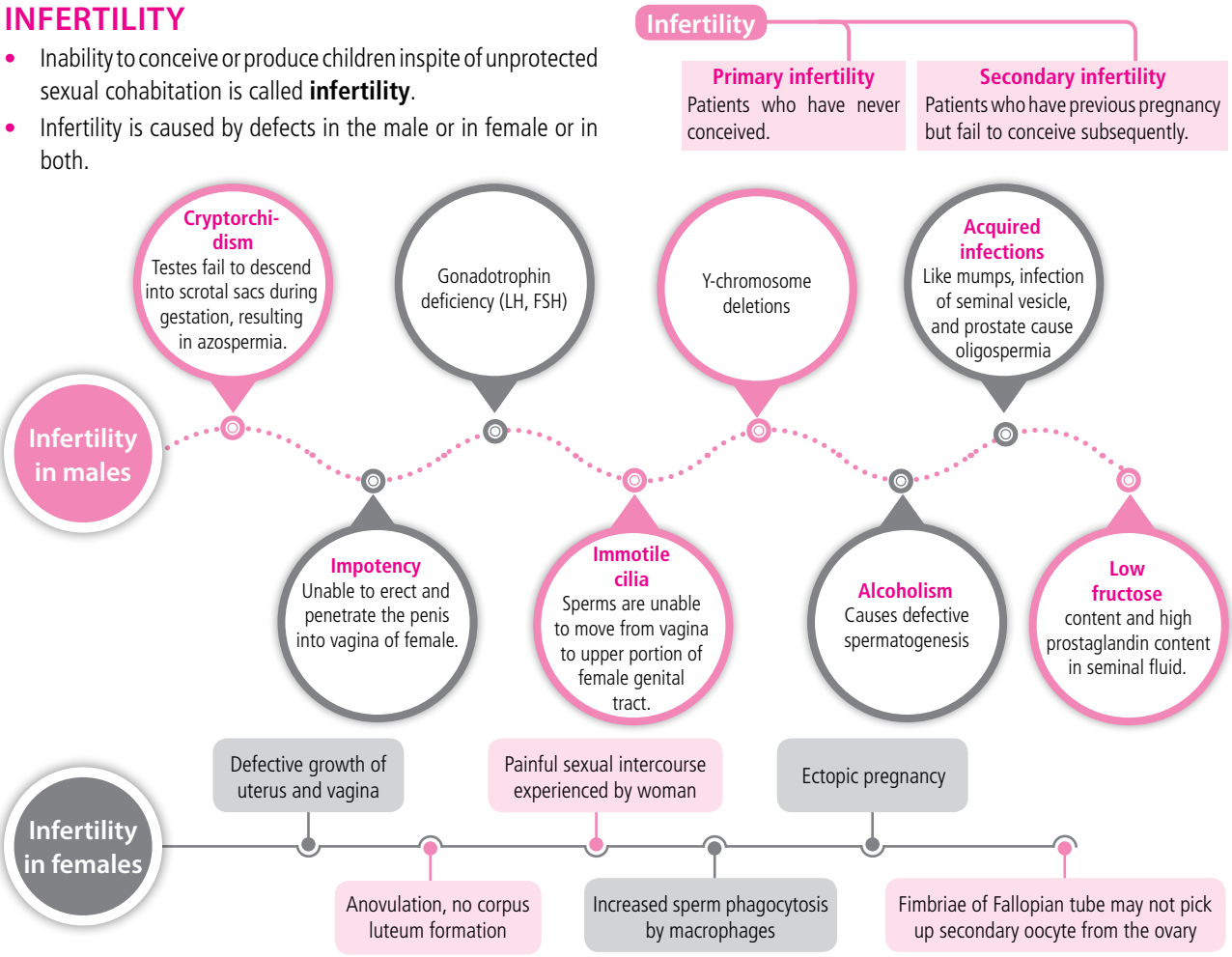
Table : Some common STDs

Disease	Pathogen	Transmission	Incubation period	Symptoms	Diagnosis	Treatment
I. STDs caused by Bacteria						
Syphilis	*Treponema pallidum*	Through sexual contact and from mother to child.	10-90 days	Symptoms of the **first stage** are painless ulcer or chancre on the genitals and swelling of local lymph glands. In the **second stage,** chancre is healed and there are skin lesions, rashes, hair loss, swollen joints and flu-like illness occasionally. In the **tertiary stage,** chronic ulcers appear on palate, nose and lower leg. There can be paralysis, brain damage, blindness, heart trouble and aortic impairment.	(a) Antibody detection, *e.g.*, VDRL (b) ELISA test	Antibiotics, *e.g.*, penicillin, tetracycline
Gonorrhoea	*Neisseria gonorrhoeae*	Sexual contact, common toilets and under clothes	2-5 days	The bacterium lives in genital tubes, produces pus containing discharge, pain around genitalia and burning sensation during urination. It may lead to arthritis and eye infection in children of gonorrhoea afflicted mothers.	Gram staining of discharge and culture	Antibiotics *e.g.*, Penicillin, Ampicillin
Chancroid	*Haemophilus ducreyi*	Sexual contact	–	Appearance of ulcer at the site of infection generally over external genitalia and swelling of nearby lymph glands. Ulcer is painful and bleeds easily.	Staining of discharge and cell culture	Antibiotics, *e.g.*, Erythromycin, ciprofloxacin, Trimethoprim sulpha-methoxazole
II. STDs caused by Viruses						
AIDS	Human Immuno-deficiency virus (HIV)	Through semen, blood, infected mother's milk	6 months - 10 years	Fever, lethargy, pharyngitis, weight loss, nausea, headache, rashes, etc. HIV attacks helper T-lymphocytes, the patient gets immune deficiency.	ELISA, PCR	Anti-retroviral drugs such as zidovudine and didanosine prolong life span of AIDS patients
Hepatitis B	Hepatitis B virus (HBV)	Blood transfusion, sexual contact, saliva, tears, intravenous drug abuse, tatooing, ear and nose piercing, sharing of razors, etc.	30-80 days	Fatigue, jaundice, persistent low grade fever, rash and abdominal pain. It can cause cirrhosis and possibly liver cancer.	Hepatitis B surface antigen (HBSAg), ELISA	Tenofovir or Entecavir
Genital herpes	Herpes simplex virus	Genital secretions and through contact with viroids and genitalia.	–	Vesiculopustular lesions followed by clusters of painful erythematous ulcers over external genitalia and peri-anal regions, vaginal and urethral discharge and swelling of lymph nodes.	Antigen detection, PCR, nucleic acid hybridisation	Acyclovir, valacyclovir or famciclovir
Genital warts	Human papilloma virus	Sexual intercourse	–	Benign, hard outgrowths with horny surface (warts) over the skin and mucosal surface of external genitalia and peri-anal area.	Antibody detection, culture and DNA hybridisation	Cryosurgery is used in removal of warts. *Podophyllum* preparations and podofilox are useful in treatment. Imiquimod, an interferon inducer is also useful.

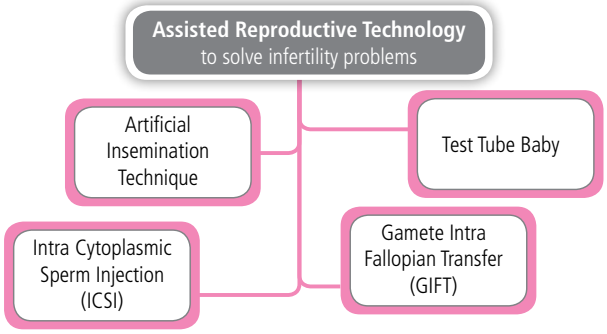
III. STD caused by Chlamydia						
Chlamydiasis	*Chlamydia trachomatis*	Sexual contact	1 week	Urethritis, epididymitis, mucopurulent, cervicitis, inflammation of Fallopian tubes, proctitis (rectal pain with mucus and occasional bleeding), etc.	Gram staining of discharge, antigen detection, nucleic acid hybridisation	Antibiotics like tetracycline, erythromycin and rifampacin
IV. STDs caused by Protozoans						
Trichomoniasis	*Trichomonas vaginalis*	Sexual intercourse	–	In females, it causes vaginitis with foul smelling, yellow vaginal discharge and burning sensation. In males, it causes urethritis, epididymitis and prostatitis resulting in pain and burning sensations.	Culture and immuno fluorescent antibody staining	Metronidazole
Amoebiasis	*Entamoeba histolytica*	Contaminated food and water, through sexual contact.	–	The patient passes blood along with the faeces and feels pain in the abdomen.	–	Antiamoebic tablets
Giardiasis	*Giardia lamblia*	Transmitted by contaminated food and water but occasionally it is transmitted by sexual intercourse.	–	Parasite lives in human intestine where it interferes with digestion and absorption of food. It causes epigastric pain, abdominal discomfort, diarrhoea, headache and sometimes fever.	–	–
V. STD caused by Nematode						
Enterobiasis	*Enterobius vermicularis* (pinworm)	Transmission occurs when patient scratches the affected area and the eggs easily get under the finger nails from where they may get into mouth. It is also transmitted by sexual intercourse.	–	Parasite causes intense itching of the anus, inflammation of mucous membrane of colon and appendix, nausea, abdominal pain and diarrhoea.	–	Antihelminthic drug
VI. STDs caused by Arthropods (Ectoparasite)						
Scabies	*Sarcoptes scabiei*	Sexual contact	–	Intense itching and patches on skin.		–
Pediculosis	*Phthirus pubis*	Intimate contact or by sharing clothes, sheets and blankets etc.	–	Painful itching and red patches on the skin of pubic region.	–	Medicated shampoos
VII. STDs caused by fungus						
Candidiasis	*Candida albicans* (vaginal yeast)	Sexual contact	–	Women with yeast infection, experience painful inflammation of the vagina often with a thick, cheesy discharge. Man may develop a painful inflammation of the urethra through sexual contact with an infected woman.	–	Antibiotics, *e.g.*, clotrimazole, miconazole and nystatin

INFERTILITY

- Inability to conceive or produce children inspite of unprotected sexual cohabitation is called **infertility**.
- Infertility is caused by defects in the male or in female or in both.



- It is caused by various reasons which can be grouped under physical, congenital, immunological or even psychological disorders.
- Specialised infertility clinics can help in the diagnosis and proper treatment of some of these disorders and enable these couples to have children.
- However, where such diagnosis and treatment are not possible, the couples can be assisted to have children through certain special techniques called **assisted reproductive technologies (ART)**.



Test tube baby programme

- This method involves *in vitro* fertilisation (IVF), *i.e.*, fertilisation of male and female gametes outside the body in almost similar conditions as that *in vivo* followed by **embryo transfer (ET).**
- In this method, ova from wife/donor female and sperms from husband/donor male are induced to form zygote in laboratory.
- Embryo upto 8 blastomeres is transferred into the Fallopian tube (**ZIFT - Zygote Intra Fallopian Transfer**) to complete its further development.
- If the embryo is with more than 8 blastomeres, then it is transferred into uterus (**IUT - Intra Uterine Transfer**) to complete its further development.
- A developing embryo can be inserted in the uterus of another female. A woman who substitutes or takes the place of the real mother to nurse the embryo is called **surrogate mother.**
- The success rate of the technique of producing test tube babies is less than 20%.

First test tube baby was born in England on July 25, 1978. It was a girl named Louise Joy Brown. Later, test tube babies were produced in Australia, United States and some other countries also.
In India, the first test tube baby named Durga (alias Kanupriya Agarwal) was born on 3rd October, 1978. The doctor was Subhash Mukhopadhyay.

Artificial Insemination (AI) Technique

- AI technique is used in cases of infertility of male partner, where the husband is either unable to inseminate the female or has very low sperm count in the ejaculation.
- In this technique the semen collected either from the husband (**artificial insemination husband; AIH**) or a healthy donor (**artificial insemination donor; AID**) is artificially introduced into the vagina or uterus (IUI - intrauterine insemination) of the female.

Gamete Intra Fallopian Transfer (GIFT)

- This method is used in females who cannot produce ova but can provide suitable environment for fertilisation and further development of embryo in the oviducts.
- In this technique, both sperms and unfertilised oocytes are transferred into Fallopian tubes of female, and fertilisation takes place inside the body of female.

Intra Cytoplasmic Sperm Injection (ICSI)

- In this technique sperm is directly injected into the cytoplasm of an ovum to form an embryo in the laboratory.
- The embryo is later transferred by ZIFT or IUT in woman.

DETECTION OF FOETAL DISORDERS DURING EARLY PREGNANCY

- Sometimes during foetal development some disorders may occur which result in abnormal offsprings. These foetal disorders during early pregnancy can be detected by following techniques:

Amniocentesis

- Amniocentesis is a foetal sex determination and disorder test based on the chromosomal pattern in the amniotic fluid surrounding the developing embryo.
- At the early stage of pregnancy (14^{th} or 15^{th} week), the location of the foetus and placenta is determined by sonography.
- Then a small amount of amniotic fluid is drawn by passing a special surgical syringe needle into the abdominal wall and uterine wall into the amniotic sac containing amniotic fluid.
- The amniotic fluid contains cells from foetus skin and respiratory tract. These cells are cultured and are used to determine chromosomal abnormalities (Down's syndrome, Klinefelter's syndrome, etc.) and metabolic disorders (phenylketonuria, sickle cell anaemia, etc.) of the foetus.
- Unfortunately, this useful technique, is being misused to kill the normal female foetuses. It has been **legally banned for the determination of sex** to avoid female foeticide.

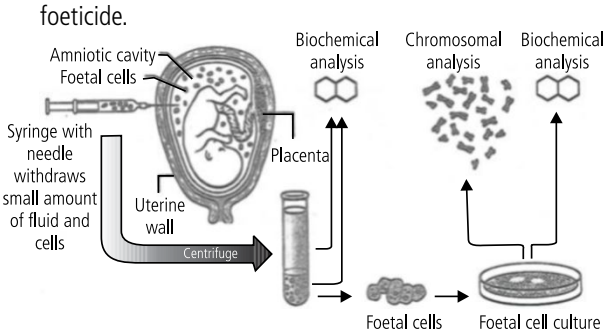


Fig.: Amniocentesis and procedure for prenatal diagnosis of biochemical and chromosomal disorders

Chorionic villus sampling (CVS)

- In this technique, the physician inserts a narrow, flexible tube through the mother's vagina and cervix into the uterus and withdraws a small amount of foetal tissue (chorionic villi) from the **placenta**.
- The rapidly dividing chorionic villi cells can be used for **karyotyping** along with some biochemical tests within a few hours.
- Being **invasive techniques**, both the amniocentesis and CVS carry with them an inherent risk to both foetus and mother.

Non-invasive techniques

One of the widely used non-invasive technique to determine foetal condition is **ultrasound imaging.**
Another technique is based on the fact that a few foetal blood cells leak across the placenta into the mother's blood stream. A blood sample from the mother provides enough foetal cells that can be tested for genetic disorders.

Foetoscopy

- Foetoscopy is another technique in which a needle-thin tube containing a viewing scope is inserted into the uterus, giving the physician a direct view of the foetus.

Important dates regarding reproductive health

April 7 ,1948 – Establishment of World Health Organization (WHO) in Geneva (Switzerland).
July 11 – World Population Day. The five billionth baby was born on July 11, 1997.
January 1, 1994 – Government of India enforced the Prenatal Diagnostic Techniques (regulation and prevention of misuse) Act, 1994.
December 1 – World AIDS Day.

Intext Practice Questions

3. (a) Which disorders can be diagnosed by chorionic villi sampling?
(b) What are the benefits and risks associated with chorionic villi sampling?

4. What is intra cytoplasmic sperm injection (ICSI) technique? In which situations, is it recommended?

SPEED PRACTICE

1. Progestasert is an IUCD which makes the uterus unsuitable and cervix hostile to the sperms as it is
(a) a hormone releasing IUCD
(b) copper releasing IUCD
(c) spermicidal
(d) non-medicated IUCD.

2. Assisted reproductive technology, IVF involves transfer of
(a) ovum into the Fallopian tube
(b) zygote into the Fallopian tube
(c) zygote into the uterus
(d) embryo with 16 blastomeres into the Fallopian tube.

3. It is a disease which mainly affects mucous membrane of urinogenital tract. In males, burning sensation on passing urine, after a yellow discharge occurs, that is accompanied by fever, headache and feeling of illness. Its name is
(a) syphilis (b) gonorrhoea
(c) AIDS (d) none of these.

4. Which of the following is wrongly matched?
(a) IUI - semen collected from husband or donor is artificially introduced either into the vagina or into the uterus.
(b) GIFT - transfer of embryos with more than 8 blastomeres into the Fallopian tube.
(c) ICSI - sperm directly injected into the ovum.
(d) ZIFT - transfer of embryos with upto 8 blastomeres into the Fallopian tube.

5. Which of the following statements is correct with reference to a test tube baby ?
(a) Fertilisation of the egg is completed outside the body; the fertilised egg is then placed in the womb of the mother where the gestation is completed.
(b) Fertilisation of the egg is completed in the female genital tract; the fertilised egg is then taken out and grown in a large test tube,
(c) A prematurely born baby is reared in an incubator
(d) Fertilisation of the egg and growth of the embryo is completed in a large test tube.

6. Given below are four methods (A-D) and their modes of action (i-iv) in achieving contraception. Select their correct matching from the four options that follow.

	Method		**Mode of Action**
A.	The pill	(i)	Prevents sperms reaching cervix
B.	Condom	(ii)	Suppress sperm motility
C.	Vasectomy	(iii)	Prevents ovulation
D.	Copper T	(iv)	Block gamete transport

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

7. Component of oral pills is
(a) progesterone (b) oxytocin
(c) relaxin (d) none of these.

8. Which of the following is a method of birth control?
(a) IUCDs (b) GIFT
(c) IUT (d) IVF-ET

9. Which of the following is a barrier method used in birth control ?
(a) Lippes loop (b) Combined pills
(c) Copper T (d) Diaphragm

10. Which of the following birth control measure can be considered as the 100% reliable method?
(a) The rhythm method
(b) Barrier method
(c) Chemical method
(d) Sterilisation techniques

11. A sexually transmitted disease symptomised by the development of chancre on the genitals is caused by the infection of
(a) *Treponema pallidum*
(b) *Neisseria gonorrhoeae*
(c) human immunodeficiency virus
(d) hepatitis B virus.

12. Main disadvantage(s) of intrauterine contraceptive devices (IUCD) is/are
(a) the devices are permanently placed in uterus and cannot be removed even if couple want to have children
(b) the device has to be inserted by physician in the uterus through vagina
(c) the devices are expelled out without the knowledge of the wearers
(d) (a) and (c).

13. Progestin-estradiol combined contraceptive pills inhibit ovulation by
(a) negative feedback on the release of estrogen from ovary required for follicular development in follicular phase
(b) preventing the uterine physiological and morphological changes required for implantation
(c) inhibiting the secretion of follicle stimulating hormone (FSH) and luteinising hormone (LH) that are necessary for ovulation
(d) Both (a) and (c).

14. Intrauterine devices (IUCDs) prevent pregnancy by
(a) inhibiting uterine physiological and morphological changes required for implantation
(b) increasing phagocytosis of sperms within uterus
(c) suppressing motility of sperms as well as their fertilising capacity
(d) all of these.

15. Which of the following is a non-medicated intrauterine device?
(a) Lippes loop (b) CuT
(c) Progestasert (d) Multiload 375

16. Hormones that are injected once every three months, that release hormones slowly and prevent ovulation are
(a) depot medroxyprogesterone acetate (DMPA)
(b) stilbestrol
(c) norethisterone enanthate (NET-EN)
(d) both (a) and (c).

17. Consider the statements given below regarding contraception and answer as directed thereafter.
(i) Medical termination of pregnancy (MTP) during first trimester is generally safe.
(ii) Generally chances of conception are nil until mother breast-feeds the infant upto two years.
(iii) Intrauterine devices like copper-T are effective contraceptives.
(iv) Contraceptive pills may be taken upto one week after coitus to prevent conception.
Which two of the above statements are correct?
(a) (i), (iii) (b) (i), (ii)
(c) (ii), (iii) (d) (iii), (iv)

18. Oral hormonal/contraceptive pills help in birth control by
(a) impairing cervix's ability to allow sperm passage
(b) inhibiting motility and secretory action of oviduct
(c) altering the uterine endometrium making it unsuitable for implantation
(d) all of these.

19. Which STD is caused by nematode?
(a) Chancroid (b) Trichomoniasis
(c) Scabies (d) Enterobiasis

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

Statement 1 : Foam tablets, cream, jellies and pastes are inserted in the vagina before intercourse to prevent sperm from entering the uterus.

Statement 2 : These contain spermicide such as lactic acid, citric acid, boric acid, zinc sulphate and potassium permanganate which kill the sperms.
(a) Both statements 1 and 2 are correct and statement 2 is the correct explanation of statement 1.
(b) Both statements 1 and 2 are correct and statement 2 is not the correct explanation of statement 1.
(c) Statement 1 is correct and statement 2 is incorrect.
(d) Both statements 1 and 2 are incorrect.

ANSWER KEY

1.	(a)	**2.**	(b)	**3.**	(b)	**4.**	(b)	**5.**	(a)
6.	(c)	**7.**	(a)	**8.**	(a)	**9.**	(d)	**10.**	(d)
11.	(a)	**12.**	(c)	**13.**	(c)	**14.**	(d)	**15.**	(a)
16.	(d)	**17.**	(a)	**18.**	(d)	**19.**	(d)	**20.**	(a)

☺☺

Spellathon

1. Make as many biological terms as possible using the given letters. Each word should contain the letter given in circle.
2. Minimum 4 letter word should be made.
3. In making a word, a letter can be used as many times as it appears in the box.
4. Make at least 1 seven letter word.

Send your response at editor@mtg.in or post to us with complete address by 25th of every month to win exciting prizes. Winners' names from October issue onwards will be declared on 1st of every month on www.mtg.in

HIGH YIELD FACTS

Class XI

Monerans and Fungi

MONERANS

- Monera is a kingdom of **prokaryotes** which includes the most primitive forms of life developed from an early stock known as **progenote**. Being the earliest forms of life, monerans are adapted to all types of habitats.

Characteristics of monerans

- Unicellular and most primitive of life forms.
- Cells are microscopic (0.1 to a few microns in length)
- Whole protoplast is covered by plasma membrane but internal compartmentalisation is absent
- DNA is naked *i.e.*, not associated with histone proteins
- Flagella if present, are single stranded, made up of protein called flagellin
- Varied nutrition including photoautotrophic, saprotrophic, parasitic and chemotrophic
- Cell wall contains peptidoglycan and polysaccharides other than cellulose
- Genetic material is not organised into a nucleus
- All membrane bound cell organelles are absent
- Mitotic spindle is absent
- Gametes are absent

Classification of monerans

Two major groups of monerans

Eubacteria
They include true bacteria. They are of two types-bacteria and cyanobacteria.

Archaebacteria
They include ancient and primitive forms of bacteria.

Analysis of various PMTs from 2012-2016

	2012	2013	2014	2015	2016
AIPMT/NEET	5	2	3	6	3
AIIMS	1	–	1	–	–
AMU	1	3	4	2	–
Kerala	1	–	2	7	5
K.CET	1	–	–	2	1
J & K	2	–	–	–	–

Archaebacteria

- They are simplest and most primitive group of bacteria. The cell wall of these bacteria is made of non-cellulosic polysaccharides and proteins (peptidoglycans and muramic acid are absent in cell wall). Branched chain lipids are present in plasma membrane of archaebacteria, due to which these can face extremes of conditions of temperature and pH.

Types of archaebacteria

Methanogens: Strictly anaerobic bacteria, mainly occur in muddy areas and also in stomach of cattle (*Methanobacterium*), where cellulose is fermented by these microbes. These are responsible for methane gas (CH_4) formation in biogas plants, as they have capacity to produce CH_4 from CO_2 or formic acid (HCOOH) (*e.g., Methanobacterium, Methanococcus*).

Halophiles: These bacteria occur in extreme saline or salty conditions *e.g., Halobacterium, Halococcus.* In these bacteria, a membrane bound protein bacteriorhodopsin is developed in sunlight. It exploits light energy to make ATP.

Thermoacidophiles: These bacteria have dual ability to tolerate high temperature as well as high acidity. They are often found in hot sulphur springs (upto 80°C). These have the capacity to oxidise sulphur to H_2SO_4 at high temperature and high acidity (*i.e.*, pH 2.0), *e.g., Thermoplasma.*

Bacteria

- The bacteria are microscopic, unicellular, true prokaryotes which reproduce by **binary fission**. They may occur singly or in aggregations to form colonies. Bacteria possess **rigid cell walls**.

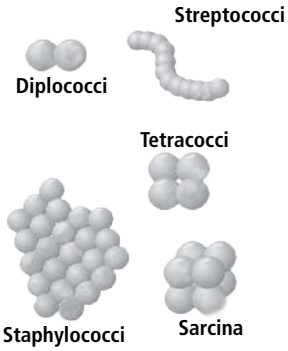
Distribution and habitat

- Bacteria occur almost everywhere *i.e.*, they are cosmopolitan. They occur in water, soil, air, animals, plants, in snow and also in hot water streams. They are found floating in the atmosphere mostly as "**wanderers**" on dust particles, they are abundant on the **surface** of the **human body** and are present in large numbers in the **intestinal tract** and on the **mucous membranes**.

Types of bacteria on the basis of shape

Cocci

These are spherical or ovoid in shape and are of 6 types: **monococci** (occur singly), **diplococci** (occur in pairs), **tetracocci** (occur in groups of 4), **streptococci** (occur in chains), **sarcinae** (occur in cubical forms, 8 or multiples of 8), and **staphylococci** (occur in clusters like grapes).



Bacilli

These are rod-shaped, which can be **palisade bacilli** (occur like stacks), **diplobacilli** (occur in pairs) or **streptobacilli** (occur in chains).

Spirilla

These are spiral or helical in shape, *e.g., Spirillum, Spirochaete, Helicobacter pylori.*

Vibrios

These are comma shaped bacteria, *e.g., Vibrio cholerae.*

Stalked

These bacteria possess stalks, *e.g., Caulobacter, Clostridium tetani.*

Budded

These bacteria are swollen at places, *e.g., Rhodomicrobium.*

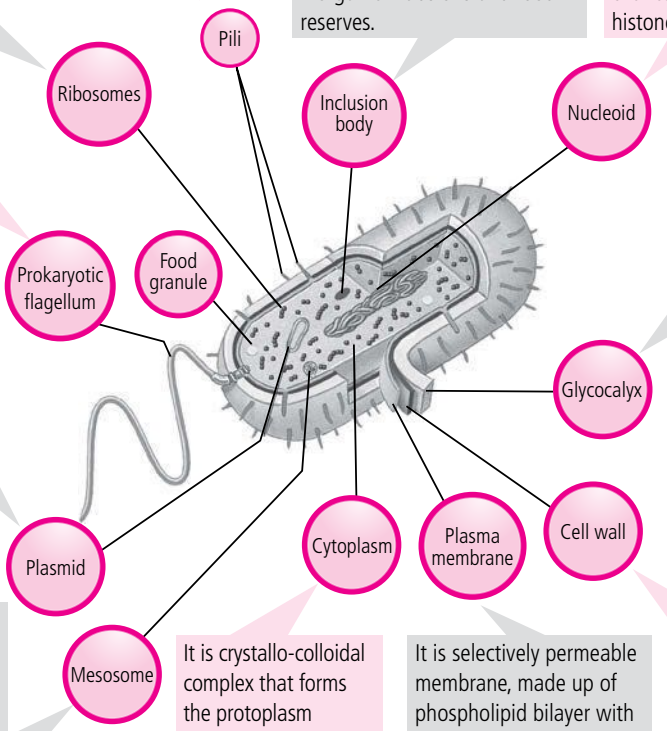
Structure of a bacterial cell

These are the organs of attachment and consist of a protein called **pilin**. These develop in response to F^+ or **fertility factor** in Gram –ve bacteria. So they are also called **sex pili**. They help in attaching to recipient cell and forming **conjugation tube**.

Inclusion bodies are non-living structures present in the cytoplasm. On the basis of their nature, the inclusion bodies are of 3 types — gas vacuoles, inorganic inclusions and food reserves.

It represents the genetic material of prokaryotes which consists of single strand of DNA duplex which is supercoiled with the help of RNA and polyamines to form a spherical/oval complex. DNA is naked (without histone proteins).

Ribosomes are **70S** in nature. Each ribosome has two subunits, larger 50S and smaller 30S. Ribosomes take part in protein synthesis.



It is a sticky gelatinous material which forms an additional surface layer. Glycocalyx may be loosely distributed (slime layer) or thick and tough (capsule). It is made of non-cellulosic polysaccharide and amino acids. It protects the cell from dessication, phagocytes, drugs, toxic chemicals, viruses etc. It also provides attachment, immunogenicity and virulence to the cells.

Flagellum is the organ of motility in bacteria. Each flagellum is 4-5μm in length and arises from a basal granule called blepharoplast. Each flagellum is made up of 3 parts *viz.* basal body, hook and filament.

Plasmids are self-replicating, extrachromosomal, segments of double stranded circular and naked DNA molecules.

It is a circular to villiform membranous structure which develops as an ingrowth from the plasma membrane. It consists of vesicles, tubules and lamellae. It takes part in the replication of nucleoid by providing point of attachment to the replicated ones.

It is crystallo-colloidal complex that forms the protoplasm excluding its nucleoid. Cytoplasmic streaming and sap vacuoles are absent.

It is selectively permeable membrane, made up of phospholipid bilayer with proteins of various types. It takes part in respiration, synthesis of lipids and cell wall components.

It provides rigidity and shape to the bacterial cell. It also protects the cell contents from external stresses and from lysis resulting from osmotic pressure. Bacterial cell wall is made up of **peptidoglycan** (or mucopeptide or murein), polysaccharides, proteins and lipids.

- On the basis of absence or presence of capsule bacteria are of two types:
  (a) **S-type bacteria:** Capsulated bacteria forming smooth colonies are called S-type bacteria. They are highly virulent.
  (b) **R-type bacteria:** Non-capsulated bacteria forming rough colonies are called R-type bacteria.

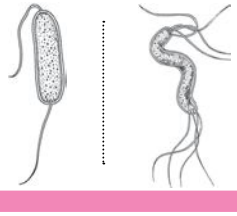
Types of bacteria on the basis of flagellation

Monotrichous

When single flagellum occurs at one end only, *e.g., Pseudomonas, Vibrio cholerae.*

Amphitrichous

When single or group of flagella is present at both the ends, *e.g., Nitrosomonas.*



Lophotrichous

When a group of flagella is present at one end only, *e.g., Spirillum volutans, Helicobacter pylori* etc.

Peritrichous

When flagella are present all over the surface of bacteria, *e.g., E. coli, Salmonella, Proteus vulgaris.*

Atrichous

When flagella are absent, *e.g., Pasteurella pestis, Lactobacillus.*

Gram positive and Gram negative bacteria

- **Christian Gram** in **1884** developed a differential staining technique known as **Gram staining technique**. Based on this technique bacteria can be divided into two large groups.

(i) **Gram +ve bacteria**

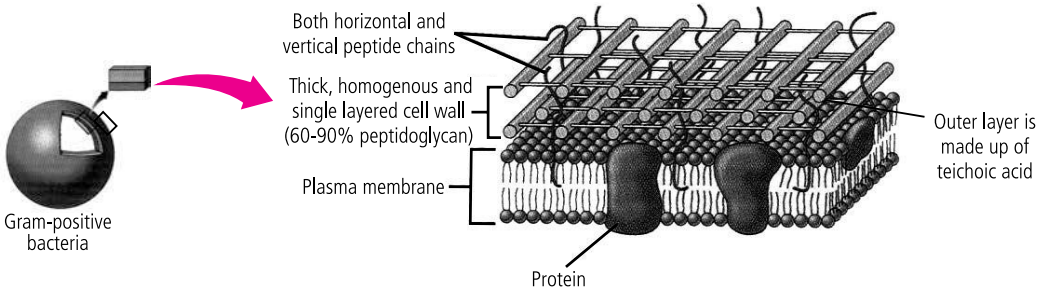


Fig.: Cell wall composition of Gram +ve bacteria

(ii) **Gram –ve bacteria**

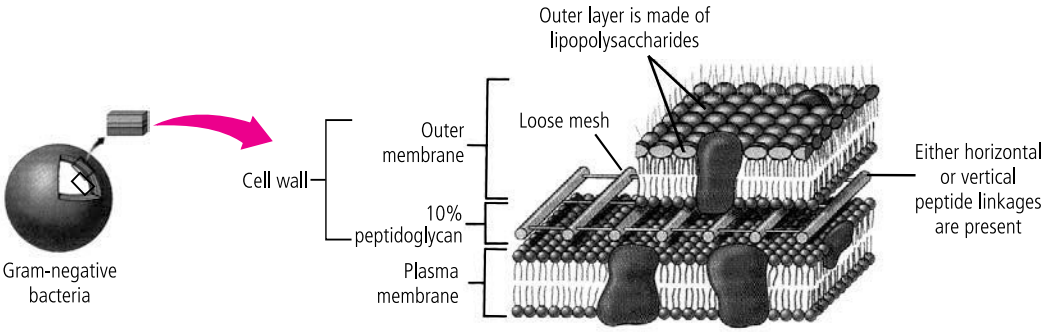


Fig.: Cell wall composition of Gram –ve bacteria

Table : Differences between Gram +ve and Gram–ve bacteria

	Gram +ve bacteria	Gram –ve bacteria
(i)	They remain coloured (blue or purple) with Gram stain even after washing with absolute alcohol or acetone.	They do not retain stain when washed with absolute alcohol.
(ii)	The wall is single layered. Outer membrane is absent.	The wall is two layered. Outer membrane is present.
(iii)	The thickness of the wall is 20-80 nm.	The thickness of wall is 8-12 nm.
(iv)	The lipid content of the wall is quite low.	The lipid content of the wall is 20-30%.
(v)	The wall is straight.	The wall is wavy and comes in contact with plasmalemma only at few places.
(vi)	Murein or mucopeptide content is 70-80%.	It is 10-20%.
(vii)	Porins are absent.	Porins or hydrophilic channels occur in outer membrane.
(viii)	Cell wall contains teichoic acids.	Teichoic acids are absent.

- Plasmids are small, circular, extrachromosomal rings of DNA present in monerans. They can replicate independent of nucleoid. They carry non-vital genes which may or may not be useful to bacteria.

Types of plasmids

- **F–plasmids:** They contain genes for conjugation or fertility.
- **R–plasmids:** They contain genes for resistance against common antibiotics.
- **Col–plasmids:** They are also called colicinogenic factors. They produce toxins called colicins or bacteriocin which are lethal to other enterobacteria.

Autotrophic nutrition involves the manufacture of organic materials from inorganic raw materials with the help of energy obtained from outside sources.

Nutrition in bacteria

Heterotrophic nutrition involves obtaining readymade organic nutrients from outside sources.

- Types of autotrophic and heterotrophic nutrition have been summarised in the given flow charts.

Types of autotrophic nutrition

Photosynthesis

- Performed by photoautotrophic bacteria.
- Bacterial photosynthesis is known as anoxygenic photosynthesis as oxygen is not evolved in it.
- Photosynthetic pigments, **bacteriochlorophyll** and **bacterioviridin** are respectively present in purple bacteria (*e.g., Thiopedia rosea, Rhodopseudomonas palustris*) and green sulphur bacteria (*e.g., Chlorobium limicola*).

Chemosynthesis

- Performed by chemoautotrophic bacteria.
- These bacteria manufacture their organic food from inorganic raw materials with the help of energy derived from exergonic chemical reactions involving **oxidation of an inorganic substance** present in the external medium *e.g., Nitrosomonas, Beggiatoa* etc.

Types of heterotrophic nutrition

Parasitic nutrition

The parasitic bacteria live in contact with other living beings for obtaining nourishment or special organic compounds required for growth *e.g., Vibrio cholerae*.

Saprotrophic nutrition

The saprotrophic bacteria obtain their food from organic remains, such as *e.g.*, corpses, animal excreta, fallen leaves etc.

Symbiotic nutrition

The symbiotic bacteria live in mutually beneficial association with other organisms *e.g., Escherichia coli,* lives as a symbiont in human intestine.

Bacterial respiration

Modes of respiration in bacteria

Facultative anaerobes

- Bacteria generally respire aerobically but can respire anaerobically in the deficiency of oxygen.
- *E.g.,* Halophiles.

Obligate aerobes

- Bacteria respire only aerobically.
- *E.g., Bacillus subtilis.*

Obligate anaerobes

- Bacteria respire only anaerobically.
- *E.g., Clostridium botulinum.*

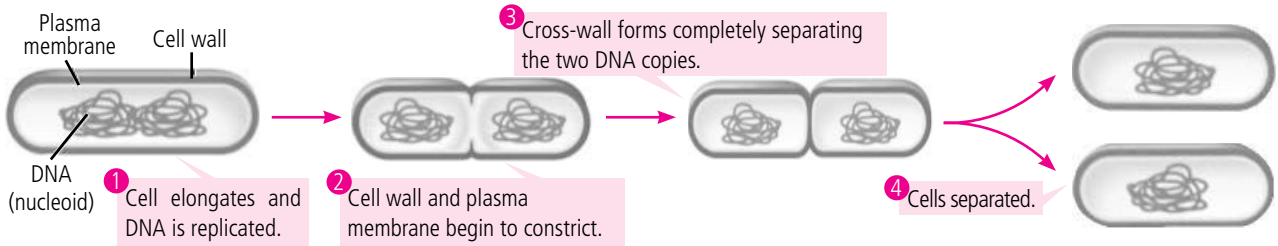
Facultative aerobes

- Bacteria respire anaerobically under normal conditions but can respire aerobically when oxygen is available.
- *E.g., Rhodopseudomonas.*

Reproduction in bacteria

- Reproduction in bacteria occurs by three methods: binary fission, sporulation and sexual reproduction.

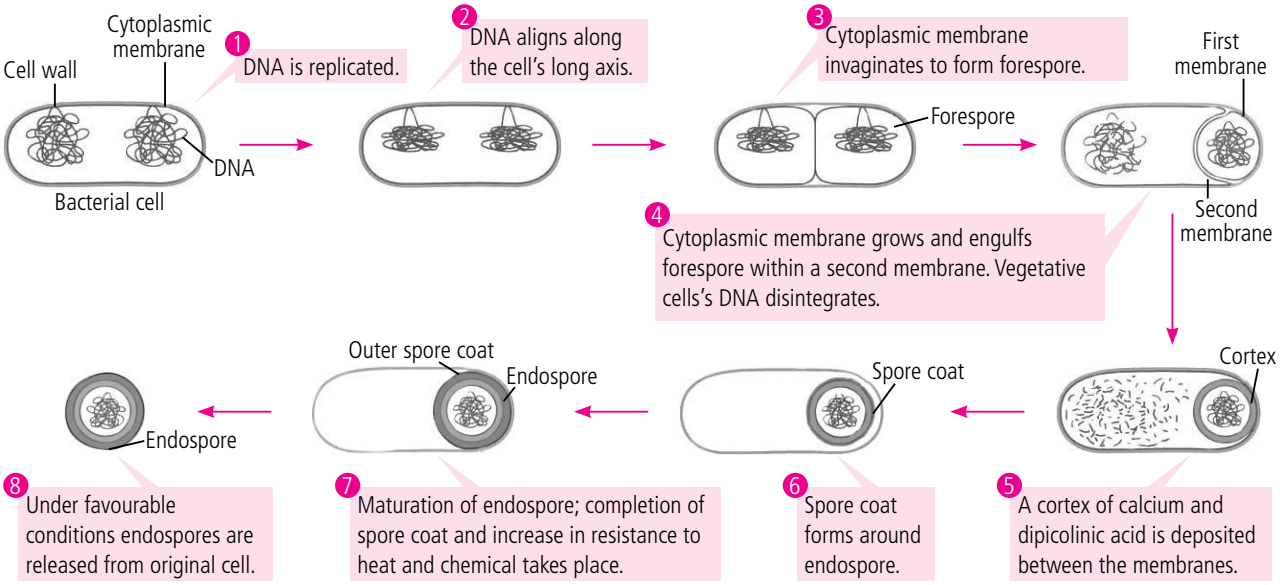
Binary fission in bacteria



- Bacteria produce several types of spores called conidia, sporangiospores, arthrospores (oidia), conidia, cysts and endospores.

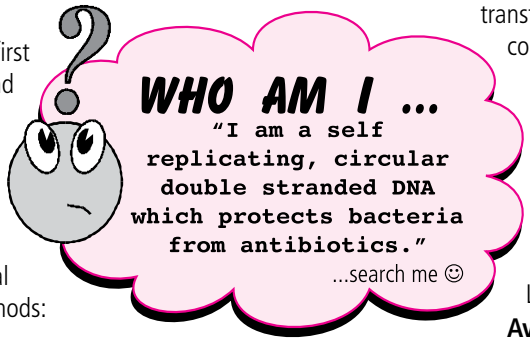
Endospore formation

- These are very thick-walled and resistant spores which are formed in response to adverse environmental conditions.



Sexual reproduction

- Sexuality in bacteria was first demonstrated by **Tatum** and **Lederberg** (1947) in *E.coli*. Typical (true) sexual reproduction is absent in bacteria, but there occurs **genetic recombination**, *i.e.*, bringing together of genetic material of two bacterial cells. Parasexually by three methods: transformation, transduction and conjugation.



(i) **Transformation :** It is the absorption of DNA segment from the surrounding medium by a living bacterium. The phenomenon was discovered by **Griffith (1928)** and hence is known as **Griffith effect**. Later on it was studied in detail by **Avery**, **McCarty** and **McLeod (1944)**.

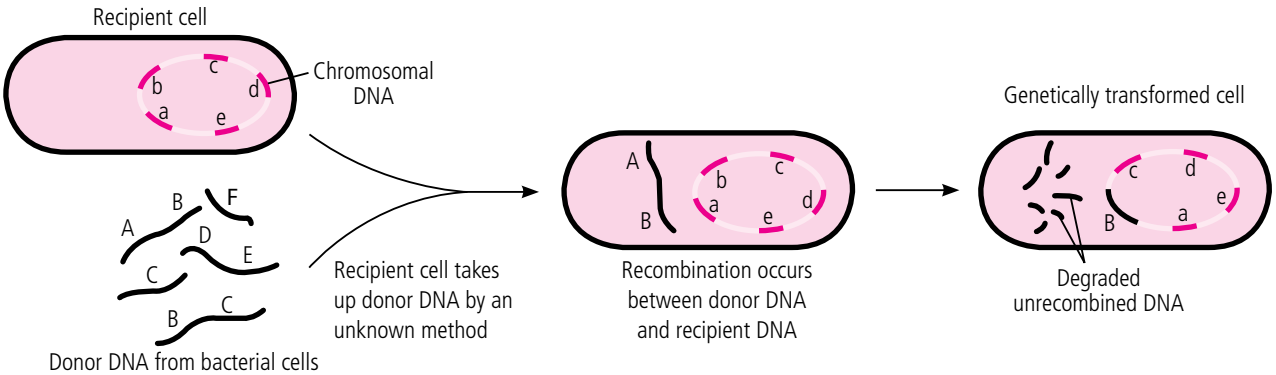


Fig.: A generalised scheme of transformation in bacteria

(ii) **Transduction :** It is the transfer of foreign genes by means of viruses (*e.g.*, bacteriophages). It was first of all reported in *Salmonella typhimurium* by **Zinder** and **Lederberg (1952)**.

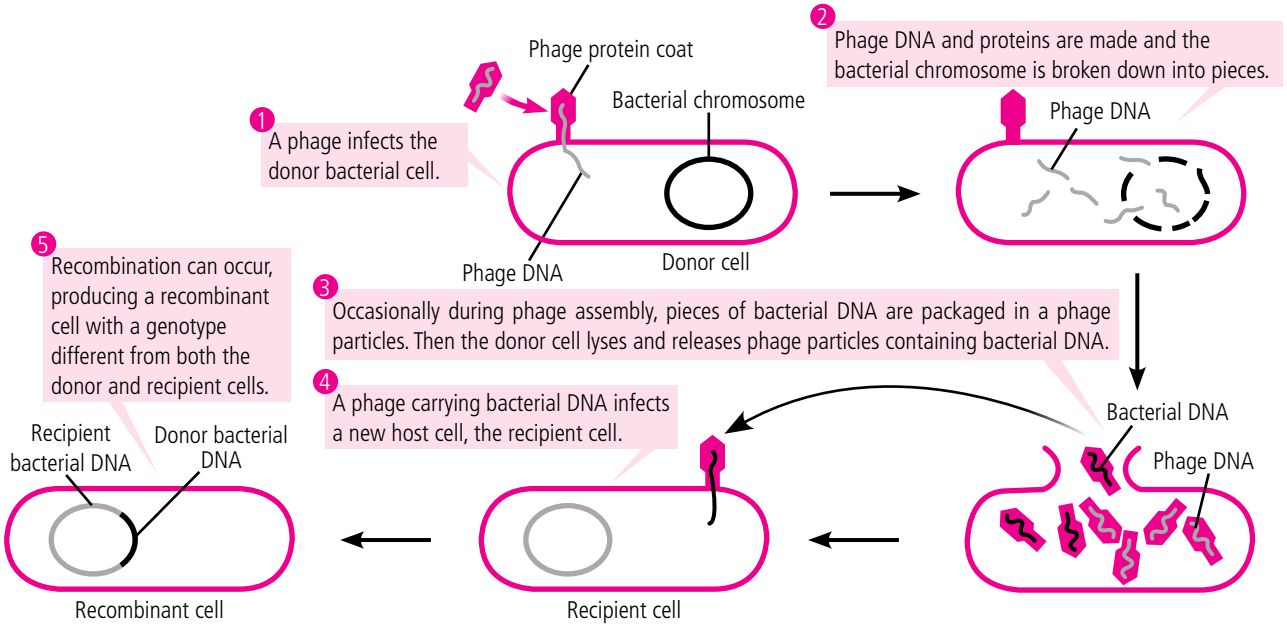


Fig.: Generalised transduction

(iii) **Conjugation :** Conjugation has been studied in detail in *E.coli* by **Lederberg, Hayes** and **Woolman**. Interchange of genetic material is accomplished by formation of conjugation tube.

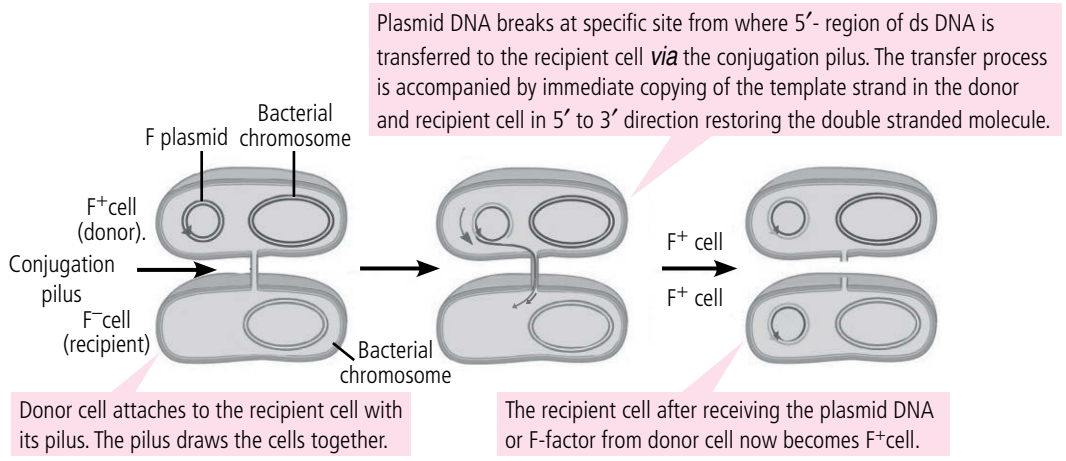


Fig.: Conjugation and transfer of an F plasmid

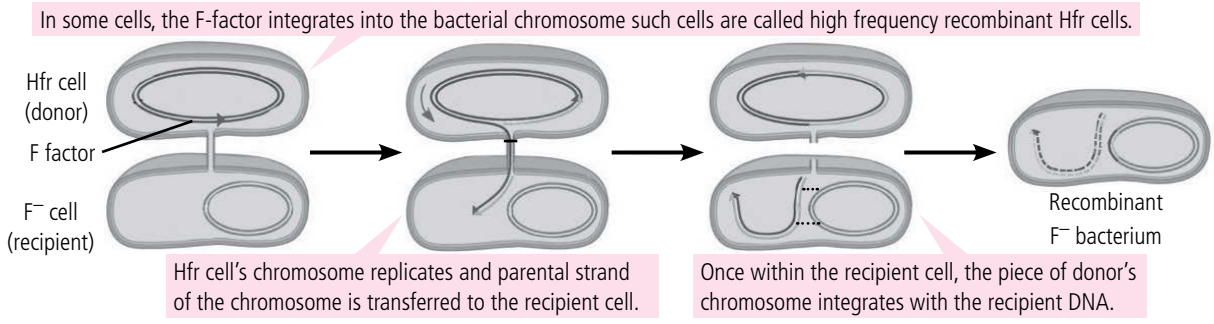


Fig.: Conjugation and transfer of an Hfr bacterial chromosome

Economic importance of bacteria

Harmful activities

- Saprotrophic bacteria cause spoilage of food.
- Food poisoning (*e.g., Clostridium botulinum*).
- Denitrification of soils *i.e* , convert nitrate of the soil into gaseous nitrogen (*e.g., Thiobacillus denitrificans, Micrococcus denitrificans*).
- Cause diseases such as syphilis, diarrhoea, citrus canker, potato wilt etc. (*e.g., Treponema pallidum, Corynebacterium diphtheriae, Xanthomonas citri, Pseudomonas solanacearum,* etc).

Beneficial activities

- Saprotrophic bacteria act as nature's scavengers.
- Release ammonia from amino acids (ammonifying bacteria, *e.g., Bacillus vulgaris*).
- Nitrifying bacteria oxidise ammonium compounds into nitrites (*e.g., Nitrosomonas, Nitrosococcus*), and nitrites into nitrates (*e.g., Nitrobacter, Nitrocystis*).
- Nitrogen fixing bacteria are able to fix free nitrogen.
- In dairy industry (*e.g.,* lactic acid bacteria).
- In vinegar production (*e.g., Acetobacter aceti*).
- In retting of fibres (*e.g., Pseudomonas fluorescence Clostridium*).
- In curing of leaves of tea (*e.g Mycococcus condisans*) and flavouring of tobacco leaves (*e.g Bacillus megatherium*)
- In production of antibiotics, such as streptomycin, chloramphenicol, tetracycline, etc. from mycelial bacterium *Streptomyces*.
- Check petroleum pollution in water bodies.
- Help in production of vitamins, enzymes, etc.

Cyanobacteria

- Cyanobacteria or blue-green algae are Gram +ve photosynthetic prokaryotes which perform oxygenic photosynthesis. Photosynthetic pigments include **chlorophyll *a*, carotenoids** and **phycobilins**.
- Cyanobacteria are highly tolerant of environmental extremes and are present in almost all aquatic and terrestrial environments. Thermophilic species may grow at temperatures upto 75°C in alkaline hot springs. Some unicellular forms grow in fissures of desert rocks. In eutrophic warm ponds and lakes, surface cyanobacteria like *Anabaena* and *Anacystis* can reproduce rapidly to form blooms. Red sea is named after the colouration provided by red coloured planktonic cyanobacteria known as *Trichodesmium erythraeum*.

Cell structure

- Cyanobacteria have typical prokaryotic cell structure.
- Cyanobacteria **lack flagella.**

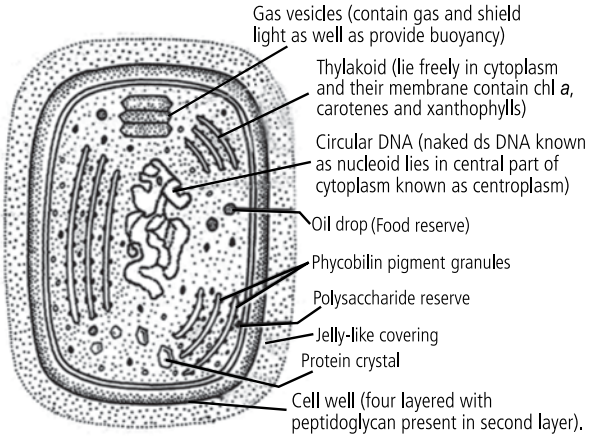


Fig.: Ultrastructure of a cyanophycean cell

Reproduction

- Cyanobacteria reproduce by **binary fission**, **fragmentation** with or without formation of small segments called hormogones, hormospores, akinetes, endospores, exospores, etc. Fragmentation of filamentous cyanobacteria can generate small, motile filaments called **hormogonia**.

Heterocyst

It is a large-sized pale coloured thick-walled cell which occurs in terminal, intercalary or lateral position in filamentous cyanobacteria, *e.g., Nostoc*. The thick wall is impermeable to oxygen but permeable to nitrogen. Heterocyst is dependent for its nourishment on adjacent vegetative cells. It has enzyme nitrogenase and is specialised to perform nitrogen fixation.

Rickettsiae

- Rickettsiae are obligate parasites. These are much smaller than other typical bacteria. These are a group of coccoid or rod-shaped bacteria. They are non-motile and reproduce by fission. They do not produce spores. Example, *Rickettsia prowazekii* (causes typhus fever).

Actinomycetes

- These are a group of filamentous bacteria having a body resembling the fungal mycelia. Because of this, they were formerly known as ray fungi.
- They grow abundantly in water and soil rich in decaying organic matter.
- Different modes of reproduction occur by conidia, sporangiospores and fragmentation.

- Most of the actinomycetes are **saprotrophic** and constitute important **decomposer organisms**, *e.g.*, *Actinomyces*. A few are **pathogenic** in plants, animals and humans, *e.g.*, *Mycobacterium*.
- A number of antibiotics are produced by actinomycetes, especially the Genus *Streptomyces*.

Mycoplasmas

- Mycoplasmas or mollicutes are the smallest known aerobic prokaryotic organisms, characterised by the absence of cell wall.
- These organisms were discovered in 1898 by **Nocard** and **Roux** in the **pleural fluid** of cattles suffering from pleuropneumonia and were, therefore, called pleuropneumonia like organisms (PPLO).
- They occur in soil, sewage water and in plant and animal bodies. Besides, they have also been found in hot water springs.

Structure of mycoplasmas

- Absence of true cell wall makes these organisms highly plastic with variable shapes.

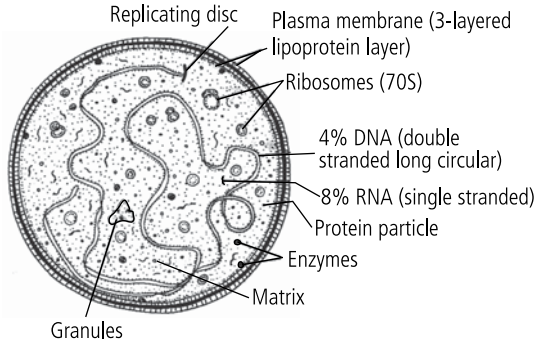


Fig.: Ultrastructure of PPLO

FUNGI

- The fungi constitute a unique kingdom of heterotrophic organisms. They are achlorophyllous, spore bearing, non-vascular organisms which often contain chitin or fungal cellulose in their walls and possess glycogen as food reserve.
- The branch of science that deals with the study of fungi is called **mycology** (Greek word *mykos* = mushroom and *logos* = discourse), and the branch that deals with the study of fungal disease is called **fungal pathology**.
- Fungi are cosmopolitan in distribution (diverse habitats). Some of them are terrestrial and some are aquatic. Many grow on humus rich soils as saprophytes *e.g.*, mushrooms. Many fungal species are parasitic, infecting plants, animals and human beings.
- Fungi grow well at 20–30°C and at acidic pH (pH 6.0).
- They obtain nutrients by absorbing soluble inorganic and organic materials from their surrounding environment.

Types of fungi according to habitat

Epiphytic fungi
Few are epiphytic, *e.g.*, *Armillaria* on apple tree which causes red rot of apple.

Symbiotic fungi
In lichens, some members of Ascomycetes and Basidiomycetes Class live in symbiotic association with algae and form lichen thalli.

Mycorrhiza (*Myks*-fungus + *rhiza*-roots)
It is an association of fungi with roots of higher plants. It may be ectotrophic, *e.g.*, *Pinus* or endotrophic, *e.g.*, orchids.

Predacious fungi
There are some soil fungi which live upon annelids, eelworms, nematodes and rotifers, etc., found in soil. Important predacious fungi are *Dactyllela, Dactylaria, Arthrobotrys, Zoophagus*, etc.

Parasitic fungi
They obtain their food from living hosts. These may be **ectophytic** (these are outside), *e.g.*, *Erysiphe* (powdery mildew) or **endophytic** (these are inside the tissue of plants), *e.g.*, *Albugo, Phytophthora, Alternaria.*

Somatic structure

- Fungi are filamentous (except yeast) consisting of long, slender thread-like structures called **hyphae**. Hypha is the unit structure that makes up the mycelium.

Types of hyphae

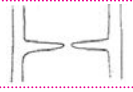
Aseptate or Coenocytic
- Cross walls are not laid down at the time of nuclear division. Hence, multinucleated cytoplasm is formed.
- *E.g., Rhizopus*

Septate
- Septa or cross walls are present in the hyphae. It can be uninucleate (monokaryotic), dinucleate (dikaryotic) or multinucleate.
- *E.g., Geotrichum*

Septa are of three types:

(i) **Complete septum** - The cross wall is complete without distinct pores.

(ii) **Septum with simple pore** -The septum possesses simple central pore.



(iii) **Dolipore septum** -The septum becomes barrel-shaped around a central pore.

Modifications of hyphae

- In some advanced fungi, hyphae undergo certain modifications in response to functional need.

Modifications of hyphae

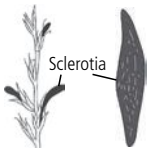
Pseudoparenchyma

Pseudoparenchyma is the mycelium in which the hyphae are very loosely packed, so individual hypha cannot be identified and appear as isodiametric cells giving the appearance of parenchyma cells in higher plants.

Prosenchyma

Hyphae lie more or less parallel to each other and unite to form a rather loosely interwoven structure where their individuality is not lost.

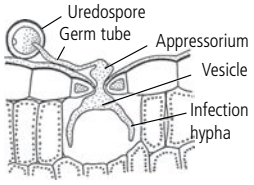
Sclerotium



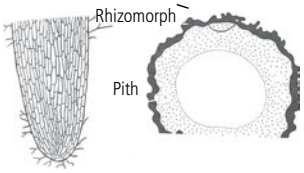
Compact globose structure formed by aggregation and adhesion of hyphae. Which represents resting stage of fungus.

Appressorium

Terminal simple or lobed swollen structure of germ tubes or infecting hyphae which helps in penetrating host cell.



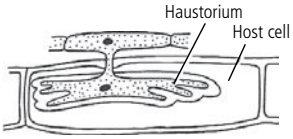
Rhizomorph



Fungal mycelia are interwoven to form thick root-like structures. The hyphae lose their individuality and the whole mass behaves as organised unit.

Haustoria

Intracellular absorbing structures of obligate parasitic fungi meant for absorbing food material from host. They secrete some specific enzymes which hydrolyse proteins and carbohydrates of the host cell.



Reproduction

- Fungi may be **eucarpic** (only a part forms reproductive body) or **holocarpic** (whole mycelium forms reproductive body).

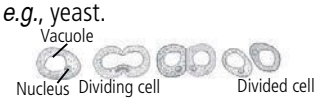
Methods of vegetative reproduction

Fragmentation

The hyphae break into pieces and each piece develops into new plant under favourable conditions, *e.g.*, *Rhizopus*, *Mucor*, *Aspergillus*, *Alternaria*, etc.

Fission

Splitting of the cell into two daughter cells by constriction, *e.g.*, yeast.

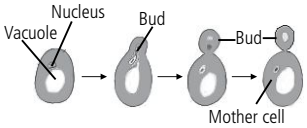


Gemmae

Resemble chlamydospores in structure but are not very durable and thick walled.

Budding

Some fungi produce small outgrowths, *i.e.*, buds from their vegetative body. After sometime, the buds are cut off and mature to form new individuals *e.g.*, yeast and *Ustilago*.



Oidium formation

The hyphae break up into numerous fragments known as oidia and give rise to new hyphae, *e.g.*, *Collybia*, *Coprinus*.

Sclerotia

They serve as organs of perennation and may be formed singly in ergot (*Claviceps*) or may be produced in large numbers from one mycelium in *Botrytis*.

Chlamydo-spores

Some fungi produce chlamydospores which are thick walled resting cells. They are intercalary in position. They are capable of forming a new plant on advent of favourable conditions.

Intext Practice Questions

1. Differentiate between photoautotrophic and chemoautotrophic bacteria.
2. Explain the cell wall composition of Gram +ve and Gram –ve bacteria.
3. Why were cyanobacteria initially grouped under Kingdom Plantae but finally placed in Kingdom Monera?

Asexual reproduction

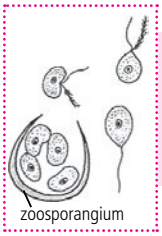
- It occurs through the formation of spores which may be motile or non-motile, naked, thin-walled or thick-walled.

Spore types

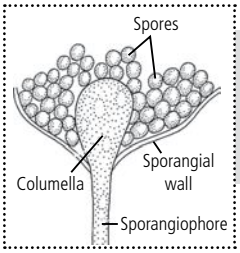
Meiospores
Spores produced after meiosis *e.g.*, ascospores, basidiospores.

Mitospores
Spores formed as a result of mitosis, *e.g.*, zoospores, chlamydospores, oidia, conidia etc.

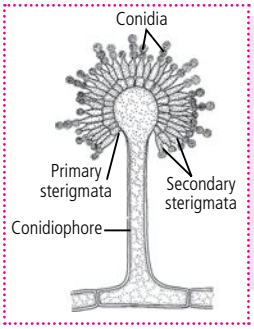
Asexual reproduction through different spores



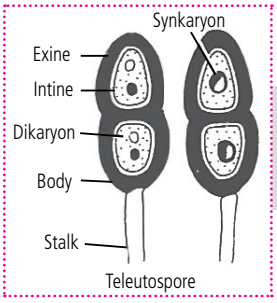
Zoospore
Zoospores are uninucleate, thin-walled motile spores formed in zoosporangia. They may be uniflagellate, *e.g.*, *Synchytrium* or biflagellate, *e.g.*, *Saprolegnia, Pythium.*



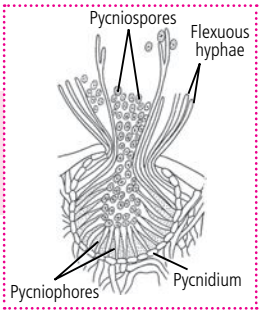
Sporangiospore
These are thin-walled, non-motile spores formed inside sporangium, which give rise to new mycelium, *e.g.*, *Rhizopus, Mucor.*



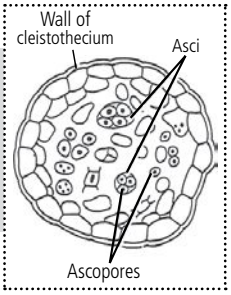
Conidia
These are non-motile, thin-walled exogenously produced spores on a conidiophore. Sometimes they are arranged in chains on the conidiophore, *e.g.*, *Aspergillus* and *Penicillium* sometimes they are present singly on conidiophore *e.g.*, *Pythium, Phytophthora.*



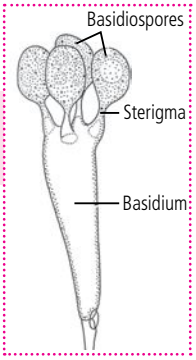
Binucleate spore
The spores are meant for multiplying the dikaryotic mycelium. They are, therefore, themselves dikaryotic, *e.g.*, aecidiospores, uredospores, teleutospore or teliospore.



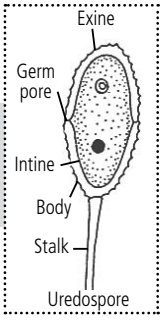
Pycniospores
These are small conidia-like bodies produced in flask-shaped cavities called the pycnia, *e.g.*, *Puccinia.*



Ascospores
These are uninucleate, unicellular, non-motile spores, usually eight in number, produced in sac-like structure called ascus. Ascospores are characteristic of Class Ascomycetes.



Basidiospores
These are produced exogenously on club-shaped basidium or sterigma.



Sexual reproduction

Sexual reproduction in fungi (except Class Deuteromycetes) is affected by the fusion of two nuclei of different parentage, which may be carried in motile or non-motile gametes, in gametangia, or in somatic cells of the thallus.

Phases in process of sexual reproduction

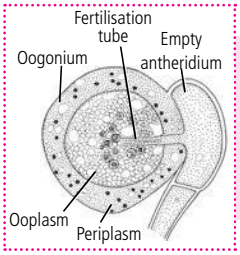
1. Plasmogany : Involves union of two protoplasts resulting in bringing the fusing nuclei of different parents close to each other.

2. Karyogamy : By fusion of two haploid nuclei, a diploid zygote is produced called karyon.

3. Meiosis : Reduction division takes place in zygote, reducing the number of chromosomes to half.

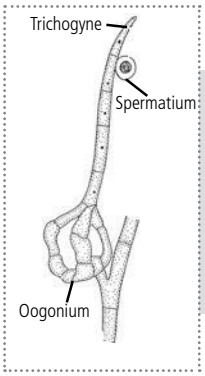
Types of sexual reproduction in fungi

Gametangial contact



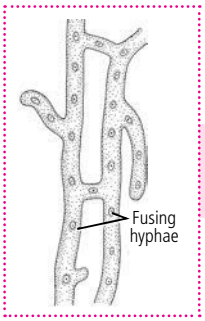
Here gametes are never released from gametangia instead the male and female gametangia come in close contact with the help of a fertilisation tube and one or more male nuclei migrate to the female gametangium.

Spermatization



Many minute spore-like single-celled structures called spermatia (non-motile male gametes) are produced by some fungi, which are transferred to special receptive hyphae (female) through water, wind and insects, etc. The contents of spermatium migrate into receptive structure, *e.g., Puccinia.*

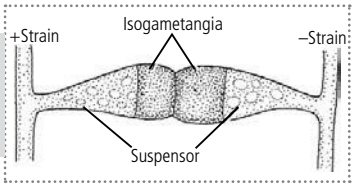
Somatogamy



Here two vegetative cells or hyphae take over the sexual function and fuse together. *E.g., Morchella, Peziza* and *Agaricus.*

Gametangial copulation

In this process fusion of entire contents of two gametangia occurs by dissolution of their common walls. Two gametangia ultimately fuse resulting in karyogamy, *e.g., Mucor, Rhizopus*, yeast.

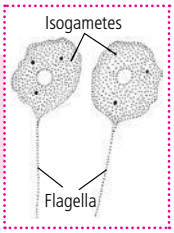


Planogametic copulation

In this, fusion of naked gametes of opposite strains takes place. Depending upon the structure and nature of fusing gametes, planogametic copulation is of 3 types:

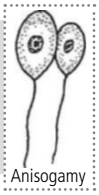
Isogamy

The fusing gametes are morphologically similar but physiologically dissimilar, *e.g., Synchytrium.*



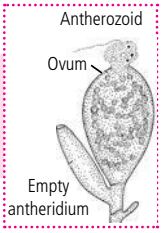
Anisogamy

The fusing gametes are both morphologically and physiologically different. The male gamete is smaller and more active than female gamete, *e.g., Allomyces.*



Oogamy

The female gamete (egg) is non-motile and the male gamete (antherozoid) is motile.



INFO SHOTS

Ravine Trapdoor spider

Ravine trapdoor spider is the common name of a rare, oddly shaped North American spider, *Cyclocosmia truncata* belonging to the trapdoor spider Family Ctenizidae. It is a burrowing spider, inhabiting riverbanks and ravines in Georgia, Alabama and Tennessee. The abdomen of the spiders in this genus is abruptly truncated and ends in a hardened disc which is strengthened by a system of ribs and grooves . The spiders use the hardened disc to clog the entrance of their burrows. The truncated abdomens of these spiders look like ancient coins.

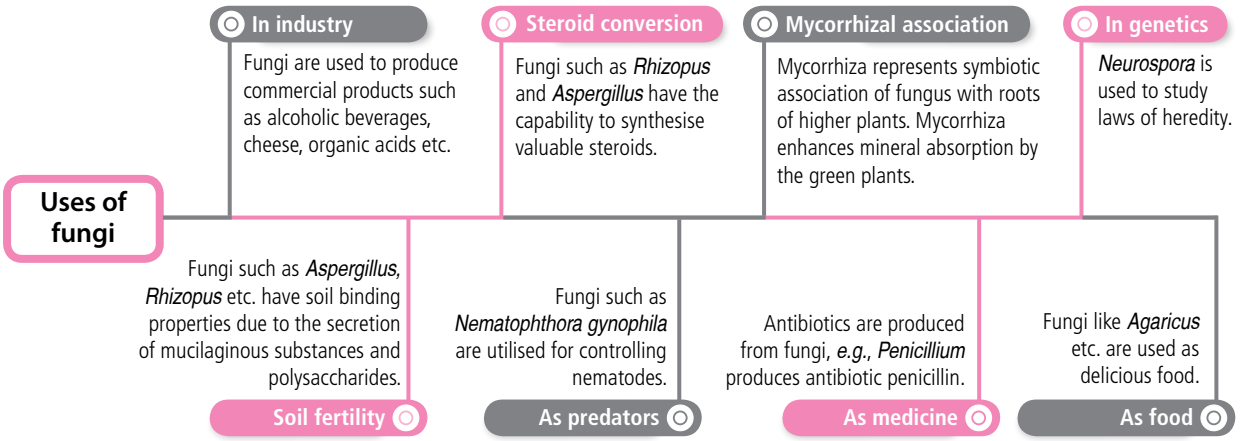
Various classes of fungi

The morphology of the mycelium, mode of spore formation and fruiting bodies form the basis for the division of Kingdom Fungi into various classes. A comparative account of various classes of fungi is given in the following table.

Table : Comparative account of various classes of fungi

Features	Phycomycetes	Ascomycetes	Basidiomycetes	Deuteromycetes
Common name	Algal fungi	Sac fungi	Club fungi	Fungi imperfecti
Mycelium	Aseptate, coenocytic	Septate, branched	Septate mycelium, primary mycelium contains monokaryotic cells and secondary mycelium contains dikaryotic cells	Branched, septate mycelium
Flagella	Two types : whiplash and tinsel	Absent	Absent	Absent
Asexual reproduction	Zoospores, aplanospores, chlamydospores, sporangiospores	Conidia, budding, oidia	Oidia, basidiospores, conidia	Conidia
Sexual reproduction	Gametangial contact, gametangial copulation	Fusion of sex cells, somatic cells, gametangial contact	Somatogamy (plasmogamy)	Absent or not known
Fruiting body	–	Ascocarp	Basidiocarp	Absent
Example	*Mucor, Rhizopus*	*Penicillium, Claviceps*	Bracket fungi, toadstool	*Colletotrichum, Helminthosporium*

- Harmful activities of fungi: Some fungi are responsible for diseases in plants, animals and humans. Fungi also spoil the food. Saprophytic fungi cause deterioration of household articles. *Amanita* is a poisonous fungi.



Intext Practice Questions

4. Write short note on reproduction in fungi.
5. What are the key characteristics of Class Basidiomycetes? Give its two examples.
6. Discuss any two modes of sexual reproduction in fungi.

POWER EXERCISE

1. Monerans do not include
(a) bacteria (b) cyanobacteria
(c) archaebacteria (d) slime moulds.

2. Zygospores are formed in
(a) *Puccinia* (b) *Penicillium*
(c) *Alternaria* (d) *Rhizopus.*

3. Which of the following characters belongs to the Kingdom Monera?
(a) Eukaryotic
(b) Heterotrophic
(c) Multicellular
(d) Presence of cell walls made of cellulose

4. Which of the following is a unicellular sac-fungus?
(a) *Claviceps* (b) *Saccharomyces*
(c) *Penicillium* (d) *Neurospora*

5. Cyanobacteria are
(a) cyanophycean members which infect bacteria
(b) virus which infect blue green algae
(c) autotrophic prokaryotes with characteristic blue green pigments
(d) bacteria which infect cyanophycean algae.

6. The deadliest mushroom is
(a) *Agaricus* (b) *Amanita*
(c) *Pleurotus* (d) *Volvariella.*

7. Which one of the following is used extensively in biochemical and genetic work?
(a) *Neurospora* (b) *Saccharomyces*
(c) *Claviceps* (d) *Penicillium*

8. Which of the following statements is true about fungi imperfecti?
(a) They do not have sexual phase.
(b) They include species that prey only on nematodes.
(c) They include toadstools, puffballs and truffles.
(d) They include *Aspergillus*, the fungus used to make soya sauce.

9. Which of the following secretes toxins during storage conditions of crop plants?
(a) *Aspergillus* (b) *Fusarium*
(c) *Colletotrichum* (d) None of these

10. Which one is a wrong statement?
(a) *Phytophthora* has coenocytic mycelium.
(b) Ascus is a sporangial sac peculiar to Class Ascomycetes.
(c) Gibberellins were first discovered in the extracts of *Fusarium moniliformae* growing on rice.
(d) *Mucor* has biflagellate zoospores.

11. The bacterium (*Clostridium botulinum*) that causes botulism is
(a) an obligate aerobe (b) a facultative anaerobe
(c) an obligate anaerobe (d) a facultative aerobe.

12. For *Mucor* zygospore
(a) is thick walled resting spore
(b) is haploid in structure
(c) result of asexual reproduction
(d) germinates to form zoospores.

13. Cell in some filamentous cyanobacteria which is specialised for nitrogen fixation is called
(a) heterocyst (b) mesosome
(c) volutin (d) phycobilisome.

14. Which one of the following is not the characteristic feature of cyanobacteria?
(a) They are always multicellular.
(b) They may form colonies.
(c) They form blooms in polluted water bodies.
(d) They can fix atmospheric nitrogen.

15. Which of the following is likely to be found in deep thermal vents?
(a) Eubacteria (b) Archaebacteria
(c) Fungi (d) BGA

16. Which of the following antibiotics is not produced by *Streptomyces*?
(a) Chloramphenicol (b) Penicillin
(c) Streptomycin (d) Tetracycline

17. Respiratory enzymes in bacteria are present in
(a) mitochondria (b) Golgi complex
(c) mesosome (d) endoplasmic reticulum.

18. The component of bacteria that retains the crystal violet stain during Gram-staining is
(a) O-antigen (b) lipopolysaccharide
(c) peptidoglycan (d) cytoplasmic membrane.

19. Which of the following is an imperfect fungus or fungus without a sexual stage?
(a) *Albugo* (b) *Penicillium*
(c) *Ustilago* (d) *Colletotrichum*

20. Monerans that are devoid of cell wall are
(a) actinomycetes (b) cyanobacteria
(c) mycoplasma (d) eubacteria.

ANSWER KEY

1.	(d)	**2.**	(d)	**3.**	(b)	**4.**	(b)	**5.**	(c)
6.	(b)	**7.**	(a)	**8.**	(a)	**9.**	(a)	**10.**	(d)
11.	(c)	**12.**	(a)	**13.**	(a)	**14.**	(a)	**15.**	(b)
16.	(b)	**17.**	(c)	**18.**	(c)	**19.**	(d)	**20.**	(c)

☺☺