

KENDRIYA VIDYALAYA SANGATHAN

CHANDIGARH REGION



SUPPORT MATERIAL

CLASS – XII

SUBJECT:- BIOLOGY

SESSION:- 2021-22 (TERM 1)

INDEX

SR NO	CHAPTER NB	NAME OF THE CHAPTER	PAGE NO
1	2	SEXUAL REPRODUCTION PN FLOWERING PLANTS	3
2	3	HUMAN REPRODUCTION	12
3	4	REPRODUCTIVE HEALTH	21
4	5	PRINCIPLES OF INHERITANCE AND VARIATION	27
5	6	MOLECULAR BASIS OF INHERITANCE	48

CHAPTER- 2

SEXUAL REPRODUCTION IN FLOWERING PLANT

Question 1. Which one of the following is not found in a female gametophyte of an angiosperm?

- (a) Germ pore
- (b) Synergids
- (c) Filiform apparatus
- (d) Central cell

Question 2. The pollen tube usually enters the embryo sac

- (a) Through one of the synergids
- (b) By directly penetrating the egg
- (c) Between one synergid and central cell
- (d) By knocking off the antipodal cells

Question 3. Milky water of tender coconut is

- (a) Liquid gametes
- (b) Liquid nucellus
- (c) Liquid female gametophyte
- (d) Liquid endosperm

Question 4. The aleurone layer in maize grain is specially rich in :

- (a) Starch
- (b) Lipids
- (c) Auxins
- (d) Proteins

Question 5. Pollen grains are able to withstand extremes of temperature and dissiccation because their exine is composed of

- (a) Cutin
- (b) Suberin
- (c) Sporopollenin
- (d) Callose

Question 6. Fertilization is depicted by the condition

- (a) $N \rightarrow 2N$
- (b) $2N \rightarrow N$
- (c) $2N \rightarrow 4N$
- (d) $4N \rightarrow 2N$

Question 7. What is the direction of micropyle in anatropous ovule?

- (a) Upward
- (b) Downward
- (c) Right
- (d) Left

Question 8. Vegetative propagation by bulbils occur in

- (a) Agave
- (b) Ginger
- (c) Vallisneria
- (d) Curcuma

Question 9. The arrangement of megaspores in a tetrad in an Angiosperm is

- (a) decussate
- (b) tetrahedral
- (c) Linear
- (d) Isobilateral

Question 10. In angiosperms all the four microspores of tetrad are covered by a layer which is formed by

- (a) Pectocellulose
- (b) Callose
- (c) Cellulose
- (d) Sporopollenin

Question 11.

The sexual reproduction in plants was first reported by

- (a) Nawaschin
- (b) Camerarius
- (c) Hanstein
- (d) Amici

Question 12.

In a type of apomixis known as adventive embryony, embryos develop directly from the

- (a) Nucellus or integuments
- (b) Zygote
- (c) Synergids or antipodals in an embryo sac
- (d) Accessory embryo sacs in the ovary

Question 13.

In some plants anthers and stigma grow and mature at same time. This phenomenon is called

- (a) Homogamy
- (b) Syngamy
- (c) Allogamy

(d) Fusion

Question 14.

In which one pair both the plants can be vegetatively propagated by leaf segments?

- (a) Agave and Kalanchoe
- (b) Bryophyllum and Kalanchoe
- (c) Asparagus and Bryophyllum
- (d) Chrysanthemum and Agave

Question 15.

Through which cell of the embryo sac, does the pollen . tube enter the embryo sac?

- (a) Egg cell
- (b) Persistent synergid
- (c) Degenerated synergid
- (d) Central cell

Question 16.

Anthesis is a phenomenon which refers to

- (a) Formation of pollen
- (b) Development of anther
- (c) Opening of flower bud
- (d) Reception of pollen by stigma

Assertion-Reason Questions

In the following questions (Q. No. 1-4) a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- (a) Both assertion and reason are true, and reason is the correct explanation of the assertion.
- (b) Both assertion and reason are true, but reason is not correct explanation of the assertion.
- (c) Assertion is true but reason is False.
- (d) Both assertion and reason are false.

17. Assertion (A) Tapetum is the innermost wall layer. It performs the function of providing nourishment to the developing pollen grains.

Reason (R): The cells of tapetum have dense cytoplasm and usually have more than one nucleus.

18. Assertion (A) The pollen mother cell undergoes meiosis to form microspores, and this process is called as microsporogenesis.

Reason (R) Some cells of the sporogenous tissue are potential pollen mother cells (PMC).

19. Assertion (A) Pollen grains are well preserved and can stay viable for long periods of time

Reason (R) The hard outer layer of pollen grains called exine is made up sporopollenin

20. Assertion (A): Pollen grains are shed at 3-celled stage in some angiosperms

Reason (R) In some species, the vegetative cell of pollen grain divides mitotically to form two male gametes

CASE STUDY BASED(1)

Pollen grains are generally spherical measuring about 25-50 micrometres in diameter. It has a prominent two-layered wall. The hard-outer layer called the exine is made up of sporopollenin which is one of the most resistant organic material known. It can withstand high temperatures and strong acids and alkali. No enzyme that degrades sporopollenin is so far known. Pollen grain exine has prominent apertures called germ pores where sporopollenin is absent. Pollen grains are well-preserved as fossils because of the presence of sporopollenin. The exine exhibits a fascinating array of patterns and designs. Why do you think the exine should be hard? What is the function of germ pore? The inner wall of the pollen grain is called the intine. It is a thin and continuous layer made up of cellulose and pectin. The cytoplasm of pollen grain is surrounded by a plasma membrane. When the pollen grain is mature it contains two cells, the vegetative cell and generative cell (Figure 2.5b). The vegetative cell is bigger, has abundant food reserve and a large irregularly shaped nucleus. The generative cell is small and floats in the cytoplasm of the vegetative cell. It is spindle shaped with dense cytoplasm and a nucleus. In over 60 per cent of angiosperms, pollen grains are shed at this 2-celled stage. In the remaining species, the generative cell divides mitotically to give rise to the two male gametes before pollen grains are shed (3-celled stage). Pollen grains of many species cause severe allergies and bronchial afflictions in some people often leading to chronic respiratory disorders– asthma, bronchitis, etc. It may be mentioned that Parthenium or carrot grass that came into India as a contaminant with imported wheat, has become ubiquitous in occurrence and causes pollen allergy.

Chronic respiratory disorders may be caused by :

21 a. Leaves

b. Flowers

c. Pollen grains

d. Wheat

22. The exine of the pollen grain is one of the most resistant materials known, called as

a. Sporopollenin

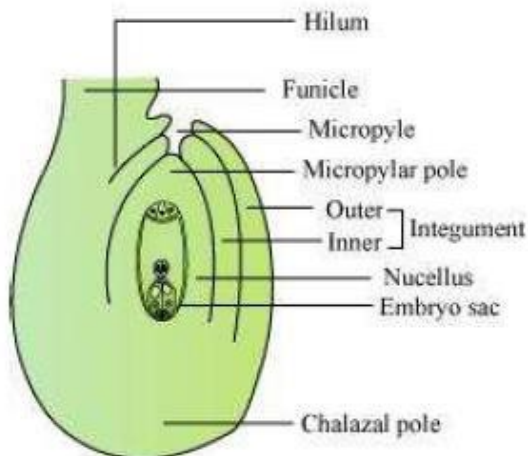
b. Cellulose and pectin

- c. Intine
 - d. Parthenium
23. Pollen tube is formed by the continuous layer called as:
- a. Exine
 - b. Intine
 - c. Male gamete
 - d. Vegetative cell
24. Two male gametes are formed by the mitotic division of the
- a. Vegetative cell
 - b. Generative cell
 - c. Pollen grain
 - d. None of the above
25. Assertion: Parthenium came to India as a contaminant of imported wheat.
Reason: It is ubiquitous and causes allergy

CASE STUDY BASED(2)

Megasporogenesis is defined as the process of formation of megaspores from the megaspore mother cell (MMC) MMC is a diploid cell.

This process occurs inside the nucellus of the developing ovule



26. The mass of cells enclosed within the integuments is Called.

- (a) Nucellus
- (c) Chalaza

(b) Micropyle

(d) Funicle

27 The integuments do not encircle the ovule at

(a) Hilum

(b) Micropyle

(c) Chalaza

(d) Funicle

28 _____ represents the basal part of the ovule

(a) Nucellus

(b) micropyle

(c) Chalaza

(d) Funicle

29 Ovules generally differentiate a _____ Megaspore mother cell/s in the micropylar region of the nucellus.

(a) One

(b) two

(c) three

(d) Four

30 Ovarian cavity is also known as :

(a) Micropylar region

(b) Micropyle

(c) Nucellus

(d) Locule

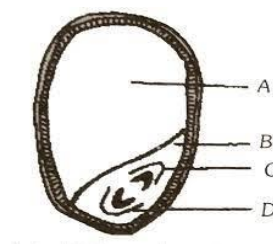
CASE STUDY BASED(3)

Embryo develops at the micropylar end of the embryo sac where the zygote is situated. Most zygotes divided only after certain amount of endosperm is formed. The early stages of embryo development are similar in both monocotyledons and dicotyledons. The zygote gives rise to the proembryo and subsequently to the globular heart-shaped and mature embryo. A typical dicotyledonous embryo consists of an embryonal axis and two cotyledons. Embryo of monocotyledons possess only one cotyledon.

31. True embryo develops as a result of fusion of

- (a) two polar nuclei of embryo sac
- (b) an egg cell and a male gamete
- (c) synergid and male gamete
- (d) a male gamete and antipodals.

32. Refer to the given diagram of the embryo of an angiospermous plant with parts labelled B,C and D. Select the correct statement(s) regarding this.



- (i) Part 'B' supplies nutrition to the developing embryo.
 - (ii) Part 'C' is the protective sheath of radicle and root cap.
 - (iii) Part 'D' is the protective sheath of shoot apex and leaf primordia.
 - (iv) The embryo shown in the diagram is present in members of Family Poaceae(Grasses)
- (a) (iv) only
 - (b) (ii) and (iii) only
 - (c) (i) and (iv) only
 - (d) (i), (ii), (iii) and (iv)

33. Which of the given statements are true?

- (i) During the development of a dicot embryo, heart-shaped embryo is followed by globular embryo.
 - (ii) The part of embryonal axis above the level of cotyledons is epicotyl, while the part below the level of cotyledons is hypocotyl.
 - (iii) Monocot seeds possess a single cotyledon represented by scutellum.
- (a) (i) and (ii)
 - (b) (ii) and (iii)
 - (c) (i) and (iii)
 - (d) (i), (ii) and (iii)

34. Consider the following parts of an embryonal axis of a dicot seed.

(i) Hypocotyl (ii) Epicotyl (iii) Radicle (iv) Plumule

In which of the following the above parts are correctly arranged from top to base?

(a) (iii) → (i) → (ii) → (iv)

(b) (ii) → (i) → (iii) → (iv)

(c) (iv) → (ii) → (i) → (iii)

(d) (iii) → (iv) → (ii) → (i)

35. In grass family, the cotyledon is called

(a) epiblast

(b) plumule

(c) scutellum

(d) perisperm

ANSWER KEY

1	A
2	A
3	D
4	D
5	C
6	A
7	B
8	A
9	C
10	B
11	B
12	A
13	A
14	B
15	C
16	C
17	A
18	C
19	A
20	A
21	C
22	A
23	B
24	B
25	B
26	A
27	B
28	C
29	A
30	D
31	B
32	C
33	B
34	C
<u>35</u>	C

CHAPTER-3

HUMAN REPRODUCTION

1. The cells which synthesise and secrete testicular hormones called androgens are
 - (a) Germ cells
 - (b) Leydig cells
 - (c) Sertoli cells
 - (d) None of the above
2. The finger like projections in the infundibulum are called
 - (a) fimbriae
 - (b) ampulla
 - (c) isthmus
 - (d) none of the above
3. Oogenesis starts-
 - (a) at menopause
 - (b) before the birth of female baby
 - (c) after the birth of female baby
 - (d) at puberty
4. Antrum is the cavity of-
 - (a) Ovary
 - (b) Graafian follicle
 - (c) Blastula
 - (d) Gastrula
5. Parturition occurs due to release of hormone oxytocin that causes-
 - (a) Stronger uterine contraction
 - (b) Expansion of birth canal
 - (c) Shrinkage of uterus
 - (d) Release of estrogen hormone.
6. How many sperms are formed by a secondary spermatocyte?
 - (a) 2
 - (b) 4
 - (c) 6
 - (d) 8
7. What happens during fertilization when all the sperms reach close to the ovum ?
 - (a) All sperms except one lose their tails
 - (b) only two sperms nearest to ovum penetrate Zona pellucida
 - (c) Cells of Corona radiata trap all the sperms except one.
 - (d) Secretion of acrosome helps one sperm enter the cytoplasm of ovum

8. At the end of first meiotic division, male sperm differentiates into-
 - (a) Secondary spermatocyte
 - (b) Primary spermatocyte
 - (c) Spermatogonium
 - (d) Spermatid
9. Withdrawal of which of the following hormone is the immediate cause of menstruation?
 - (a) FSH
 - (b) FSH-RH
 - (c) Progesterone
 - (d) Estrogen
10. Which of the following cells during gametogenesis is normally diploid?
 - (a) Spermatid
 - (b) Spermatogonia
 - (c) Secondary polar body
 - (d) Primary polar body
11. Which among these is the widest part of the fallopian tube-
 - (a) Ampulla
 - (b) isthmus
 - (c) infundibulum
 - (d) fimbriae

12. Read the following and answer any four questions from 12(i) to 12 (v) given

below-

Cleavage is the series of rapid mitotic divisions in zygote and forms blastula. The 2,4,6,8 & 16 daughter cells are called blastomeres. Embryo with 64 blastomeres is known as blastocyst and has blastocoel cavity. Blastocyst gets implanted in uterine wall and leads to pregnancy.

- (i) Solid mass of cells with 16 blastomeres is called-
 - (a) Morula
 - (b) blastula
 - (c) gastrula
 - (d) zygote
- (ii) At which stage of embryonic development trophoblast develops?
 - (a) Zygote
 - (b) Morula
 - (c) Blastula
 - (d) Gastrula
- (iii) Site of implantation is-
 - (a) Endometrium of uterus
 - (b) cervix
 - (c) uterine fundus
 - (d) infundibulum of oviduct
- (iv) Correct sequence of various structures formed during embryonic development is-
 - (a) Morula→Embryo→Gastrula→Blastula
 - (b) Zygote→Embryo→Morula→Blastula
 - (c) Blastula→Morula→Gastrula→Embryo
 - (d) Zygote→Morula→Blastula→Gastrula
- (v) **Assertion:** Side of blastocyst with inner cell mass is called animal pole.
Reason: Inner cell mass give rise to embryo.
 - (a) Both assertion and reason are true and reason is the correct explanation of assertion.
 - (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

- (c) Assertion is true but reason is false.
- (d) Both assertion and reason are false.

13. Read the following and answer any four questions from 13(i) to 13 (v) given below-

The first menstruation is called menarche, that usually occurs between 12 and 15 years. In human females, menstruation is repeated at an average interval of about 28/29 days and is called menstrual cycle. It is regulated by certain hormones, as pituitary gland is stimulated by releasing factors produced in hypothalamus. The hormones produced by pituitary gland influence the ovaries. The hormones secreted by the ovaries affect the walls of uterus.

(i) The breakdown of endometrium is characteristic of-

- (a) Proliferative phase (b) luteal phase (c) ovulatory phase (d) menstrual phase

(ii) Which days of the menstrual cycle marks the proliferative phase?

- (a) 1-5 days (b) 15-28 days (c) 6-13 days (d) 10-14 days

(iii) Which of the following occurs during secretory phase?

- (a) Empty Graffian follicle changes into Corpus luteum.
- (b) Primary follicle changes into Graffian follicle
- (c) Endometrium rebuilds and estrogen secretion increases.
- (d) LH surge inducing release of ovum.

(iv) Identify the hormones that attain peak level during ovulatory phase-

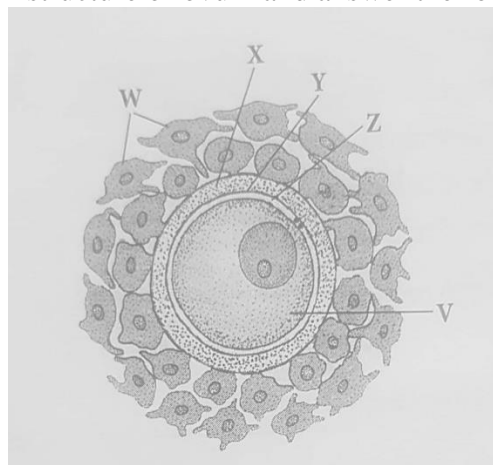
- (a) FSH (b) Progesterone (c) LH (d) Both a & c

(v) Withdrawal of which hormone causes degeneration of corpus luteum?

- (a) FSH (b) LH (c) Progesterone (d) Estrogen

14. Read the following and answer any four questions from 14(i) to 14 (v) given below-

The mature ovum or a female gamete is spherical in shape. The human ovum is almost free of yolk and is said to be alecithal. Human ovum loses its ability to fertilize about 24 hours after ovulation. Refer to the given structure of ovum and answer the following questions-



(i) Thick cellular layer formed of radially elongated follicular cells is-

- (a) Zona pellucida (b) plasma membrane (c) perivitelline space (d) corona radiata

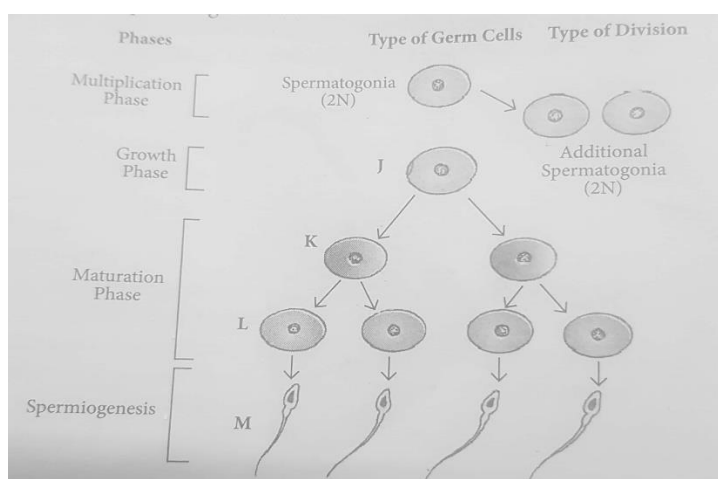
- (ii) In humans, at which stage does ovum get released from ovary?
 (a) Secondary oocyte (b) Oogonium (c) primary oocyte (d) First polar body
- (iii) Cytoplasm of ovum is enveloped by-
 (a) Zona pellucida (b) corona radiata (c) cell membrane (d) perivitelline space
- (iv) Select the correct option

	V	W	X
a	Cytoplasm	Zona pellucida	Plasma membrane
b	Cortical granules	Corona radiata	Zona pellucida
c	Cortical granules	Plasma membrane	Corona radiata
d	cytoplasm	Corona radiata	Zona pellucida

- (v) Which of the following is not a characteristic of ovum?
 (a) Nucleus of ovum has prominent nucleolus
 (b) Only one ovum is formed from one oogonium
 (c) It lacks centrioles
 (d) It has very small amount of ooplasm

15. Read the following and answer any four questions from 15 (i) to 15 (v) given below-

In testes, the immature male germ cells produce sperms by spermatogenesis that begins at puberty. It occurs in the seminiferous tubules of the testes. Seminiferous tubules are lined by germinal epithelium. Study the schematic representation of spermatogenesis and answer the following questions.



- (i) Which cell division occurs during multiplication phase?
 (a) Mitosis (b) Meiosis I (c) Meiosis II (d) Both b & c
- (ii) How many chromosomes are present in secondary spermatocyte and spermatid respectively?
 (a) 46, 23 (b) 46, 46 (c) 23, 23 (d) 23, XY
- (iii) Transformation of L into M is known as-
 (a) Spermiation (b) spermateliosis (c) spermatogenesis (d) none of these

- (iv) Select the correct option-
- (a) Type A spermatogonia grows to larger primary spermatocyte
 - (b) One spermatogonium forms two spermatids
 - (c) Spermiation is the release of sperms from seminiferous tubules
 - (d) Primary spermatocyte undergoes mitosis to form secondary spermatocytes
- (v) Which hormone acts on spermatogonia to stimulate sperm production?
- (a) LH (b) GnRH (c) ABP (d) FSH

16. Read the following and answer any four questions from 16 (i) to 16 (v) given below-

Study the given table and answer the questions based on it.

	Hormone	Source	Function
A	Oxytocin	W	Ejection of milk
B	X	Anterior lobe of pituitary	Stimulates secretion of ABP from Sertoli cells
C	Y	Placenta	Maintains corpus luteum to secrete progesterone
D	Relaxin	Ovary	Z

- (i) Identify the hormones X and Y respectively.
- (a) Testosterone, FSH
 - (b) LH, Hpl
 - (c) FSH, hCG
 - (d) ICSH, Hcg
- (ii) W in the given table is-
- (a) Hypothalamus
 - (b) posterior lobe of pituitary
 - (b) Placenta
 - (d) ovary
- (iii) Which of the following is correct for Z?
- (a) Dilation of uterine cervix during labour pains.
 - (b) Stimulates the growth of mammary glands during pregnancy
 - (c) Supports the foetal growth and prevents dessication
 - (d) Forms protective plug in cervix of uterus during pregnancy.
- (iv) Which sets of hormones is secreted only during pregnancy?
- (a) Human chorionic gonadotropin, relaxin ,Human placental lactogen
 - (b) Human placental lactogen, Estrogen, chorionic thyrotropin
 - (c) Human chorionic gonadotropin, Human placental lactogen, Progesterone
 - (d) chorionic thyrotropin, Chorionic gonadotropin, estrogen
- (v) **Assertion:** Follicle stimulating hormone controls the maintenance and functions of male reproductive organs.
- Reason:** FSH directly acts on spermatogonia to stimulate sperm production.
- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
 - (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
 - (c) Assertion is true but reason is false.
 - (d) Both assertion and reason are false.

17. Read the following and answer any four questions from 17 (i) to 17 (v) given below-

During copulation, semen is released by the penis into the vagina. The motile sperms swim rapidly, fuse with ovum in the ampullary region, resulting in fertilization. Haploid nucleus of sperm fuse with that of ovum to form diploid zygote.

(i) In female genital tract, sperms are made capable of fertilizing the egg. This phenomenon os sperm activation is called-

(a) Amphimixis (b) cortical reaction (c) capacitation (d) acrosomal reaction

(ii) Select the correct sequence of various physical and chemical events that take place during fertilization.

P. Fusion of cortical granules with plasma membrane of secondary oocyte.

Q. Formation of fertilization cone to receive sperm.

R. Release of sperm lysin from acrosome.

S. Mixing up of chromosomes of a sperm and an ovum.

(a) R→Q→P→S

(b) Q→ S→ R→ P

(c) Q →R →S→ P

(d) R→ P→ Q →S

(iii) Assertion: Only one sperm can fertilise an ovum.

Reason: The secretion of acrosome help the sperm to enter into cytoplasm of ovum through zona pellucida and plasma membrane.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b)Both assertion and reason are true but reason is not the correct explanation of assertion.

(c)Assertion is true but reason is false.

(d)Both assertion and reason are false.

(iv) What is the significance of fertilization?

(a) It restores haploid number of chromosomes

(b) It produces offsprings genetically identical to parents.

(c) It initiates cleavage

(d) Both b and c

(v)Site of fertilization in human beings is-

(a) Endometrium of uterine cavity

(b) ampullary isthmic junction of oviduct

(c) cervix of uterus

(d) infundibulum of fallopian tube

For question numbers 18-30, two statements are given -one labelled Assertion and the other labelled Reason. Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b)Both assertion and reason are true but reason is not the correct explanation of assertion.

(c)Assertion is true but reason is false.

(d)Both assertion and reason are false.

18. Assertion: In human male, testes are extra abdominal and lie in scrotal sacs.

Reason: Scrotum acts as thermoregulator and keeps testicular temperature lower by 2 degreecelcius for normal spermatogenesis.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

- (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Both assertion and reason are false.

19. **Assertion:** Cilia lining of the fallopian tube helps to pick up and push the released ovum into oviduct.

Reason: Cilia of fallopian tubes beat towards uterus.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
- (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Both assertion and reason are false.

20. **Assertion:** Epididymis is divided into three parts.

Reason: Epididymis is the organ that stores spermatozoa.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
- (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Both assertion and reason are false.

21. **Assertion:** In morula stage, the cells divide without any increase in size.

Reason: Zona pellucida remains undivided till cleavage is complete.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
- (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Both assertion and reason are false.

22. **Assertion:** Head of sperm consists of acrosome and mitochondria.

Reason: Acrosome contains spiral row of mitochondria.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
- (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Both assertion and reason are false.

23. **Assertion:** One oogonium produces one ovum and three polar bodies.

Reason: Polar bodies have small amount of cytoplasm.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
- (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Both assertion and reason are false.

24. **Assertion:** At the time of implantation, which takes place in 14 days, the human embryo is called blastocyst.

Reason: Implantation occurs in gastrula stage.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
- (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Both assertion and reason are false.

25. **Assertion:** Ovulation is the release of egg

Reason: Ovulation takes place on 14 days after fertilization.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
- (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Both assertion and reason are false.

26. **Assertion:** Mammary gland is a modified sweat gland.

Reason: Mammary gland is functional in both males and females.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.

- (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
 (c) Assertion is true but reason is false.
 (d) Both assertion and reason are false.

27. **Assertion:** The endometrium undergoes cyclical changes during menstrual cycle.

Reason: The myometrium exhibits strong contractions during delivery of baby.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
 (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
 (c) Assertion is true but reason is false.
 (d) Both assertion and reason are false.

28. **Assertion:** Seminiferous tubule is related with spermatogenesis.

Reason: Spermatogenesis takes place under the influence of pituitary gonadotrophins and testosterone.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
 (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
 (c) Assertion is true but reason is false.
 (d) Both assertion and reason are false.

29. **Assertion:** Each seminiferous tubule is lined on its inside by three types of cells.

Reason: These cells are male germ cells, Sertoli cells, and Leydig's cells.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
 (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
 (c) Assertion is true but reason is false.
 (d) Both assertion and reason are false.

30. **Assertion:** The division of the developing ovarian follicles is completed just after conception second meiotic

Reason: Conception is the blastocyst takes place.

- (a) Both assertion explanation of
 (b) Both assertion correct explanation of
 (c) Assertion is true
 (d) Both assertion

1	b
2	a
3	b
4	b
5	a
6	b
7	d
8	a
9	c
10	b
11	a
12 (i)	a
12 (ii)	c
12 (iii)	a

division.
 onset of pregnancy when the implantation of
 and reason are true and reason is the correct
 assertion.
 and reason are true but reason is not the
 assertion.
 but reason is false.
 and reason are false.

ANSWER KEY

12 (iv)	d
12 (v)	b
13 (i)	d
13(ii)	c
13(iii)	a
13(iv)	d
13(v)	b
14 (i)	d
14 (ii)	a
14 (iii)	c
14 (iv)	b
14 (v)	d
15 (i)	a
15 (ii)	c
15 (iii)	b
15 (iv)	c
15 (v)	d
16 (i)	c
16 (ii)	b
16 (iii)	a
16 (iv)	a
16 (v)	b
17 (i)	c
17 (ii)	d
17 (iii)	b
17 (iv)	c
17 (v)	b
18	a
19	a
20	b
21	b
22	d
23	b
24	d
25	c
26	c
27	b
28	b
29	d
30	b

CHAPTER: - 4

Name of Chapter – Reproductive Health

MCQs

1. Which of the following is hormone releasing?

- (a) Multiload 375
- (b) LNG-20
- (c) Lippes loop
- (d) Cu 7

2. Which among the following is commonly called withdrawal method?

- (a) Lactational amenorrhoea
- (b) Coitus interruptus
- (c) Periodic abstinence
- (d) Rhythm method

3. In which of the following ARTs, does in vivo fertilisation occur?

- (a) ZIFT
- (b) GIFT
- (c) ICSI
- (d) IVF

4. Surgical methods, also called sterilisation techniques are fool-proof methods to prevent pregnancy. But, because

- (a) it is nearly irreversible.
- (b) of lack of sufficient facilities in many parts of the country.
- (c) of fear that it will reduce sexual drive.
- (d) all of these

5. Emergency contraceptives are effective if used within

- (a) 72 hrs of coitus.
- (b) 72 hrs of ovulation.
- (c) 72 hrs of menstruation.
- (d) 72 hrs of implantation.

6. Condoms are one of the most popular contraceptives because of the following reasons

- (a) these are effective barriers for insemination.
- (b) they do not interfere with coital act.
- (c) these help in reducing the risk of STDs.
- (d) all of the above.

7. Intensely lactating mothers do not generally conceive due to the

- (a) suppression of gonadotropins.
- (b) hyper secretion of gonadotropins.
- (c) suppression of gametic transport.
- (d) suppression of fertilisation.

8. The method of directly injecting a sperm into ovum in assisted reproductive, technology is called

- (a) GIFT
- (b) ZIFT
- (c) ICSI
- (d) ET

9. The oral contraceptive pills mainly contain the hormones

- (a) estrogen and luteinising hormone.
- (b) progesterone and estrogen.
- (c) estrogens and follicle-stimulating hormone.
- (d) progesterone and follicle-stimulating hormone.

10. Diaphragms are the contraceptive devices used by females. Choose the correct option about them.

- (a) They are reusable.
- (b) They block the entry of sperms.
- (e) They are placed to cover the cervix.
- (d) All of these.

11. ZIFT is transfer of

- (a) zygote into fallopian tube.
- (b) a mixture of sperms and ova into the fallopian tube.
- (c) a mixture of sperms and ova into the uterus.
- (d) embryo into the uterus.

12. 'Saheli' is a/an

- (a) oral contraceptive for females.
- (b) surgical/sterilisation method for females.
- (c) diaphragm for females.
- (d) surgical/sterilisation method for males.

13 Which of the following is ART?

- (a) IUDs
- (b) GIFT
- (c) ZIFT
- (d) Both (b) & (c)

14 Which of these can be used to cure infertility in couples where male partner has very low sperm count

- (a) IUD
- (b) GIFT
- (c) IUI
- (d) None of these

15 Increased IMR and decreased MMR in a population will

- (a) cause rapid increase in growth rate
- (b) result in decline in growth rate

- (c) not cause significant change in growth rate
- (d) result in an explosive population.

16 Which of the following cannot be detected in a developing foetus by amniocentesis ?

- (a) Jaundice
- (b) Down's syndrome
- (c) Cystic fibrosis
- (d) Colourblindness

17 A national level approach to build up a reproductively healthy society was taken up in our country in

- (a) 1950s
- (b) 1960s
- (c) 1980s
- (d) 1990s

18 From the sexually transmitted diseases mentioned below, identify the one which does not specifically affect the sex organs.

- (a) Syphilis
- (b) AIDS
- (c) Gonorrhea
- (d) Genital warts

19 Which of the following is correct regarding HIV, hepatitis B, gonorrhoea, trichomoniasis ?

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

20 RCH stands for

- (a) routine check-up of health
- (b) reproduction cum hygiene
- (c) reversible contraceptive hazards
- (d) reproductive and child health care.

ASSERTION AND REASONING TYPE OF QUESTIONS

These questions consist of two statements each, printed as Assertion and Reason. While answering these one of the following four responses.

- A. If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.
- B. If both Assertion and Reason are true but the Reason is not a correct explanation of the Assertion.
- C. If Assertion is true but the Reason is false.
- D. If both Assertion and Reason are false

1. Assertion: Use of condom is a safeguard against AIDS and sexual diseases besides checking pregnancy.
Reason: Certain contraceptives are planted under the skin of the upper arm to prevent pregnancy

2. Assertion: Amniocentesis is often misused.

Reason: Amniocentesis is meant for determining the genetic disorders in the foetus, but is being used to determine if a female foetus may be aborted.

3. Assertion: Human population now doubles every 35 years as against 200 years in 1600-1800.

Reason: Rapid increase is due to better health facilities and food resources

4. Assertion: Zero population growth should be achieved as early as possible to control human population.

Reason: This requires not two children per couple but a little more.

5. Assertion: Mother should not be blamed for the birth of girls in the family.

Reason : Father is responsible for the sex of the child.

6 Assertion: A person should be considered reproductively healthy if they have healthy reproductive organs.

Reason: This statement about reproductive health was given by WHO.

7 Assertion: Introduction of sex education in schools should be encouraged.

Reason: This will encourage children to believe in myths about sex related aspects.

Case Study Based Question

Q1. Over population causes number of family problems. strategies like birth control methods help to control population. Some methods of birth control do not involve medication or devices to prevent pregnancy but rather rely on behavioural changes in the menstrual cycle.

1. Which method helps in contraception by temporary absence of sex?
 - a) Coitus interruptus
 - b) Withdrawal method
 - c) Rhythm method
 - d) Lactational amenorrhea method
2. Why is lactational amenorrhea effective for about 4 to 5 months after parturition ?
 - a) Ovulation occurs on about the 14th day of menstruation
 - b) Ovulation Does not occur during intense lactation.
 - c) This method inhibits mobility of sperms
 - d) Both b and c
3. On which days of menstrual cycle should coitus be avoided to prevent fertilisation ?
 - a) 10-17.
 - b) 6-13.
 - c) 1-5.
 - d) 15-28
4. Which fact is not the basis of periodic abstinence method of birth control. ?
 - a) Ovum remains alive for about 1 to 2 days.
 - b) Ovulation occurs on about 14 days of menstruation.
 - c) Sperms survive for about three days.
 - d) Alteration in the uterine endometrium

Q2. Intra uterine devices are most widely accepted methods of contraception .These are used by females a the uterus through vagina. However these devices are not recommended for those who eventually intend

1. How does CuT prevent conception?
 - a)Copper ions Make uterus unsuitable for implantation.
 - b)Copper ions Make cervix hostile to the sperms.
 - c) Copper ions suppress sperm motility
 - d)Copper ions inhibit ovulation
2. Which of the following IUDs makes uterus unsuitable for implantation ?
 - a)LNG-20.
 - b)Multiload 375.
 - c) Cu7.
 - d)Lippes loop
- 3 . Identify the correct statement for IUDs
 - a)They slowly release Synthetic progesterone in the body.
 - b)They increase Phagocytosis of sperms within the uterus.
 - c) The block entry of sperms through the cervix.
 - d). Both b and c
4. Select the correct matched pair
 - a). Hormone releasing IUD - LNG 20
 - b). Non medicated IUD. - Progestasert
 - c). Copper releasing IUD. - Lippes loop
 - d) none of these

Q3.Medical termination of pregnancy is termination of pregnancy before the foetus become viable .To and consequent maternal mortality MTP amendment act 2017 was enacted by the government of India in a year all over the world .

- 1) Abortion can be safely done for about. _____weeks of pregnancy .
 - a) 4.
 - b). 12.
 - c)8-10.
 - d) 15-18
- 2). How is MTP helpful in decreasing human population ?
 - a) By. aborting normal female foetus.
 - b) By increasing maternal mortality rate
 - c) By getting rid of unwonted pregnancies
 - d). None of these

- 3). MTP was legalised by government of India in
a) 1971.
b). 1982.
c). 1973.
d) 1991
- 4). Select an incorrect statement for MTP
a) Second trimester abortions are more risky then first trimester
b) It is being misused to abort normal female foetus
c) It helps to get rid of unwonted pregnancies
d)Child detected with congenital heart disease cannot be aborted

Answer key

MCQs

1.b 2.b 3.b 4.d 5.a 6.d 7.a 8.c 9.b 10.d
11.a 12.a 13.d 14.c 15.b 16.a 17.a 18.b 19.c 20.d

Assertion and Reasoning

1.b 2 a 3.a 4.a 5.b 6.d 7.c

Case study based

Q1. 1(c) 2(a) 3(d) 4(d)
Q2. 1(c) 2(a) 3(b) 4(a)
Q3. 1(b) 2(c) 3(d) 4(a)

Chapter 5

Principles of Inheritance And Variations

1 If a homozygous tall plant is crossed with homozygous dwarf plant, the off springs will be

- (a) all tall plants (b) all dwarf plants (c) half tall plants (d) half dwarf plants

2 Pure line breed refers to

- (a) homozygosity (b) heterozygosity (c) linkage (d) both b & c

3 If a homozygous red flowered plant is crossed with a homozygous white flowered plant, the off springs would be

- (a) all red flowered (b) half red flowered (c) half white flowered (d) all white flowered

4 Primary source of allelic variation is

- (a) independent assortment (b) recombination (c) mutation (d) polyploidy

5 How many different types of gametes can be formed by F1 progeny, resulting from the following cross $Tt Rr$?

- (a) 4 (b) 8 (c) 27 (d) 64

6 Grain colour in wheat is determined by three pairs of polygene. Following the cross $AABBCC$ (dark colour) \times $aabbcc$ (light colour), in F2 generation what proportion of the progeny is likely to resemble either parent?

- (a) Half (b) Less than 5 percent (c) One third (d) None of these

7 Mating of an organism to a double recessive in order to determine whether it is homozygous or heterozygous for a character under consideration is called

- (a) reciprocal cross (b) test cross (c) dihybrid cross (d) back cross

8 Three children in a family have blood types O, AB and B respectively. What are the genotypes of their parents?

- (a) $I^A i$ and $I^B i$ (b) $I^A I^B$ and $i i$ (c) $I^B I^B$ and $I^A I^A$ (d) $I^A I^A$ and $I^B i$

9 Read the following statements and choose the correct option.

Statement A: The law of segregation is the most fundamental principle of heredity that has universal application with no exception.

Statement B: The law of segregation is also called law of purity of gametes/ spores as segregation of two alleles of a trait results in gamete/ spores receiving only one allele out of a pair.

- (a) Both statements A and B are correct
- (b) Statement A is correct but statement B is incorrect
- (c) Statement A is incorrect but statement B is correct
- (d) Both statements A and B are incorrect

10 In *Antirrhinum* (Snapdragon), a red flower was crossed with a white flower and in F_1 generation all pink flowers were obtained. When pink flowers were selfed, the F_2 generation showed white, red and Pink flowers. Choose the incorrect statement from the following.

- (a) Law of segregation does not apply in this experiment
- (b) This experiment does not follow the principle of dominance
- (c) Pink flower in F_1 is due to incomplete dominance
- (d) Ratio of F_2 is $\frac{1}{4}$ (red): $\frac{2}{4}$ (pink) : $\frac{1}{4}$ (white)

11 Which of the following pairs of contrasting traits were studied in pea plant by Mendel constitute recessive characters?

- (a) White flowers and yellow seeds
- (b) Constricted pod and green seeds
- (c) Green pod and dwarf plants
- (d) Yellow seed and yellow pod

12 Select the correct option for F_1 generation regarding Mendelian inheritance

- (a) It is pure breeding line
- (b) It is first hybrid generation
- (c) Its phenotype is intermediate of both the parents
- (d) Both (a) and (c)

13 What were the phenotypes F_2 generation plants obtained by selfing of heterozygous tall F_1 plants in Mendel's monohybrid cross?

- (a) $\frac{1}{4}$ tall and $\frac{3}{4}$ dwarf
- (b) $\frac{1}{4}$ dwarf and $\frac{3}{4}$ tall
- (c) $\frac{1}{4}$ tall, $\frac{2}{4}$ intermediate and $\frac{1}{4}$ dwarf
- (d) All tall

14 Choose the best explanation for the mechanism of inheritance keeping in mind Mendel's law of segregation and independent assortment.

- (a) A characteristic is inherited in combination with others.
- (b) The presence of one characteristic (e.g., colour) modifies the inheritance of other (e.g., shape).
- (c) A characteristic (say shape) is inherited independent of the influence of other (e.g., colour).
- (d) Rare combination of characters is always due to mutations, which are inherited by the progeny.

15 Given below are few statements regarding the Mendel's experimental investigations on laws of inheritance. Choose the incorrect statement.

- (a) Mendel conducted artificial/cross pollination experiments using several true breeding pea lines.
- (b) Initially he took 34 pairs of varieties of pea plants, then 22, but ultimately worked with only 7 pairs of varieties.
- (c) During the experiments, Mendel called genes by the term 'factors'.
- (d) Out of the seven pairs of contrasting characters studied by Mendel, the number of seed based characters are four.

16 In a dihybrid cross, when a heterozygous pea plant with green inflated pod are self-crossed. The off spring plant with green constricted pod are represented by the genotype

- (a) GgIi, GgII, GGII (b) Ggii, GGii, ggii (c) Ggii, GGii (d) ggIi, ggII

17 A white colour flower is found to be dominant over violet colour flower. The genotype of white flower can be determined by

- (a) Back cross (b) test cross (c) monohybrid cross (d) dihybrid cross

18 The F_1 of genotype Tt were self-pollinated. The resultant F_2 plants appear to be both tall and dwarf in the phenotypic ratio 3:1. What would be the genotypic ratio of the F_2 generation plants?

- (a) 1:2:1 (b) 1:3:1 (c) 1:1:2 (d) 1:1:2

Q.19 Down's syndrome is associated with trisomy of chromosome number:

- (a) 20
- (b) 21
- (c) 22
- (d) 23

Q.20 Syndrome in humans in which individual's somatic cells contain the three sex chromosomes XXY is called:

- (a) Superfemale
- (b) Turner's syndrome
- (c) Down's syndrome
- (d) Klinefelter's syndrome

Q.21 A human female with Turner's syndrome:

- (a) is able to produce children with normal husband.
- (b) has one additional X-chromosome.
- (c) has 45 chromosomes with XO.
- (d) exhibits male character

Q.22 Choose the wrong statement.

- (a) In grasshoppers, besides autosomes males have only one X-chromosome, whereas females have a pair of X- chromosomes.
- (b) In XY type of sex determination, both males and females have same number of chromosomes.
- (c) In Drosophila, males of one X- and one Y-Chromosome, whereas females have a pair of X- chromosomes besides autosomes.

- (d) In birds, females have one Z and one W chromosomes, whereas males have a pair of Z chromosomes besides autosomes.
- (e) In insects with XO type of sex determination, all sperms bear X-chromosome beside autosomes.

Q.23 Genes which are located only in the Y-chromosome are known as:

- (a) epistatic genes
- (b) holandric genes
- (c) Operator genes
- (d) antiepistasis genes

Q.24 In order to lessen the suffering of phenyl phenylketonurics their diet should have:

- (a) No phenylalanine and no tyrosine
- (b) Low phenylalanine and normal requirement of tyrosine
- (c) Normal recommended amount of phenylalanine
- (d) Normal recommended amount of both phenylalanine and tyrosine

Q.25 Which of the following set of syndromes show 47 chromosomes in their genetic makeup?

- (a) Down's syndrome, Patau's syndrome, Edward's syndrome
- (b) Turner's syndrome, Edward's syndrome, Klinefelter's syndrome
- (c) Klinefelter's syndrome, Turner's syndrome, Edward's syndrome
- (d) All of the above

Q.26 An abnormal human baby with 'XXX' sex chromosomes was born due to:

- (a) Formation of abnormal sperms in the father.
- (b) Formation of abnormal ova in the mother.
- (c) Fusion of two sperms and one ovum.
- (d) Fusion of two ova and one sperm.

Q.27 The nuclear structure observed by Henkings in 50% of the insect sperm after spermatogenesis was:

- (a) X-body
- (b) autosome
- (c) Y-chromosome
- (d) Nucleolus
- (e) Polyploidy

Q.28 The disorder caused by point mutation is:

- (a) tetany
- (b) Down's syndrome
- (c) Sickle Cell anaemia
- (d) Turner's syndrome
- (e) Klinefelter syndrome

Q.29 Which one of the following statements is relevant to sex linked characters?

- (a) They always follow Criss-cross inheritance
- (b) They do not follow Criss-cross inheritance
- (c) They are mostly present on Y chromosome
- (d) They are only present on X chromosome

Q.30 Identify the correct order of organisation of genetic material from largest to smallest:

- (a) Chromosome, gene, genome, nucleotide
- (b) Genome, chromosome, nucleotide, gene
- (c) Genome, chromosome, gene, nucleotide
- (d) Chromosome, genome, nucleotide, gene

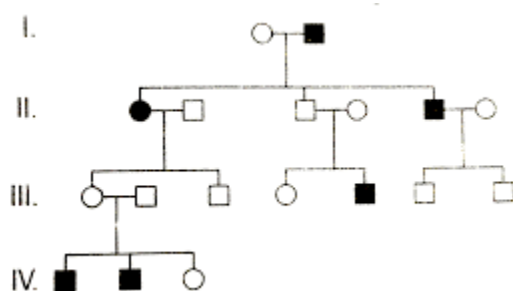
Q.31 A pleiotropic gene:

- (a) Is the gene evolved during Pliocene
- (b) Is expressed only in primitive plants
- (c) Controls multiple traits in an individual
- (d) Control a trait only in combination with another gene

Q.32 The term 'linkage' was coined by:

- (a) T.H. Morgan
- (b) T. Boveri
- (c) G. Mendel
- (d) W. Suttun

Q.33 In the following human Pedigree, the filled symbols represent the affected individuals. Identify the type of given pedigree



- (a) Autosomal dominant
- (b) X-linked recessive
- (c) Autosomal recessive
- (d) X-linked dominant

Q.34 Pick out the correct statements:

- (i) Down's syndrome is due to aneuploidy
- (ii) haemophilia is a sex-linked recessive disease.
- (iii) phenylketonuria is an autosomal recessive gene disorder.

(iv) Sickle-Cell anaemia is an excellent recessive gene disorder

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

Q.35 If A colour-blind man married women who is homozygous for normal colour vision, the probability of their son being colour-blind is:

- (a) 0
- (b) 1
- (c) 0.5
- (d) 0.75

Q.36 The mechanism that causes a gene to move from one linkage group to another is called:

- (a) Inversion
- (b) Duplication
- (c) Translocation
- (d) Crossing-over

Q.37 The hereditary disease in which the urine of a person turns Black on exposure to air due to the presence of homogentisic acid is known as

- (a) ketonuria
- (b) haematuria
- (c) alkaptonuria
- (d) phenylketonuria

Q.38 Choose the wrong statement.

- (a) Failure of segregation of chromatids during cell division results in aneuploidy
- (b) Additional copy of 'X' chromosome in males result in Klinefelter's syndrome
- (c) Closely located genes in a chromosome always assort independently resulting in recombinants.
- (d) According to Mendel, recessive character never blend in heterozygous condition
- (e) Failure of cytokinesis after DNA replication results in polyploidy

Q.39 Sex determination by chromosomal difference in man and drosophila is by mechanism called.

- (a) XX-XY
- (b) XX-XO
- (c) ZZ-ZW
- (d) (a) and (b)

Q.40 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

41 Which of the following cannot be explained on the basis of law of segregation?

- (a) Alleles do not show blending
- (b) Each gamete / spore contains only one of the allele of a gene
- (c) Separation of alleles is independent of each other during gamete / spore formation
- (d) 3:1 phenotypic ratio is obtained in the F_2 generation of a monohybrid cross

42 If a man with blood group AB marries a woman with blood group AB, their children may have

- (a) A and B blood groups only
- (b) A, B and AB blood groups only
- (c) A blood group only
- (d) A, B and O blood group only

43 Select the incorrect match regarding contrasting trait in pea plant studied by Mendel.

Character	Dominant/Recessive
(a) Flower colour	Violet/ white
(b) Pod colour	Green/ yellow
(c) Pod shape	constricted/ inflated
(d) Seed colour	Yellow/ green

44 Read the given statements regarding the law of independent assortment and select the correct option.

- (i) Separation of alleles of two pairs of traits are independent of each other during gamete formation
 - (ii) Rearrangement of alleles (random union) in the off spring occur at the time of fertilization
 - (iii) This law can be explained with the help of monohybrid cross
 - (iv) It produces only parental traits
- (a) (i) and (iv) (b) (ii), (iii) and (iv) (c) (i) and (ii) (d) (i), (iii) and (iv)

45 A cross was made between two plants. The resultant off springs carries 50% dominant phenotypic character (T) and 50% recessive phenotypic character (t). What would be the genotype of parents?

- (a) Tt X Tt (b) Tt X tt (c) TT X Tt (d) TT X tt

46 The blood group of a child is 'O'. If the blood group of father is 'B; and of mother is 'A'. Find out the genotypes of the parents.

- (a) $I^B i$ and $I^A i$ (b) $I^B I^B$ and $i i$ (c) $I^B I^B$ and $I^A i$ (d) $i i$ and $I^A I^A$

47 A cross was made between a pure round yellow seeded pea plant (RRYY) with wrinkled green seeded pea plant (rryy) then F_1 plants obtained are all round and yellow seeded. When F_1 plants were self-pollinated, four types of plants- round yellow, round green, wrinkled yellow and wrinkled green were obtained in F_2 generation. Find out the number of plants that were produced round yellow seeds.

- (a) 2 (b) 4 (c) 6 (d) 9

48 Complete the given passage with appropriate words or phrases.

In the case of co-dominance, the (i) resembles both parents. A good example is different types of RBC that determine ABO blood grouping in humans. ABO blood groups are controlled by (ii). (ii) has three alleles (iii), (iv) and (v). Because humans are (vi) organisms, each person possesses any (vii) of the three alleles. In case of incomplete dominance, (viii) and (ix) are same. Incomplete dominance is also known as (x) inheritance.

49 In a plant, red fruit (R) is dominant over yellow fruit (r) and tallness (T) is dominant over shortness (t). If a plant with RRTt genotype is crossed with a plant that is rrtt, then

- (a) 25% will be tall with red fruit
- (b) 50% will be tall with red fruit
- (c) 75% will be tall with red fruit
- (d) All the off springs will be tall with red fruit

50 A person with blood group A possesses

- (a) Antigen A and antibody A
- (b) Antigen B and antibody A
- (c) Antigen A and antibody B
- (d) No antigen and no antibody

51 Match the 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

C Pleiotropy

(iii) In a heterozygous organism both alleles express themselves

D Polygenic inheritance

(iv) A single gene influences many characters

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

52 Mendel's work was published in

- (a) 1866
- (b) 1884
- (c) 1900
- (d) 1901

53 How many types of gametes are found in F_1 progeny of cross AABBCC and aabbcc

- (a) 3
- (b) 8
- (c) 27
- (d) 64

54 Out of a population of 800 F_2 individuals of a cross between yellow round and green wrinkled pea plants, the number of yellow wrinkled seeds would be

- (a) 150
- (b) 200
- (c) 400
- (d) 800

55 9:3:3:1 ratio is due to

- (a) Segregation (b) Independent assortment (c) Crossing over (d) Homologous pairing

56 Test cross is crossing between

- (a) Genotype with dominant trait
(b) Genotype with recessive trait
(c) F_1 hybrid with double recessive
(d) Two F_1 hybrids

57 Mendel's experimental organism was

- (a) *Homo sapiens*
(b) *Antirrhinum majus*
(c) *Pisum sativum*
(d) *Drosophila melanogaster*

58 Genotype of hybrid is determined by

- (a) Crossing one F_1 progeny with recessive parent
(b) Crossing one F_1 progeny with another F_1 progeny
(c) Crossing one F_1 progeny with female parent
(d) Crossing one F_1 progeny with male parent

59 Human blood grouping is called ABO instead of ABC because O signifies

- (a) No antigen (b) Over dominance (c) One antibody (d) Other antigen

60 Which of the following genotype does not produce any oligosaccharide on the surface of RBCs?

- (a) $I^B I^B$ (b) $I^B I$ (c) $I^A i$ (d) ii

61 In *Antirrhinum* two plants with pink flowers were hybridised. The F_1 plants produced red, pink and white flowers in the proportion of 1 red, 2 pink and 1 white. What could be the genotype of the two plants used for hybridisation? Red flower colour is determined by RR and white by rr genes.

- (a) rr (b) Rr (c) RR (d) rrrr

62 A test cross is carried out to

- (a) Predict whether two traits are linked
(b) Assess the number of alleles of a gene
(c) Determine the genotype of F_2 plants
(d) determine whether two species or varieties will breed successfully

63 Which Mendelian idea is depicted by a cross in which F_1 generation resembles both the parents

- (a) Codominance (b) Incomplete dominance
(c) Law of dominance (d) Inheritance of one gen

Q.64 Assertion : The person heterozygous for Sickle-Cell trait produces more than normal (Hb^A) and abnormal hemoglobin (Hb^S).

Reason : The normal allele and the sickle allele are codominant.

- A. If both Assertion and Reason are true and reason is the correct explanation of Assertion.
B. If both Assertion and Reason are true but reason is not the correct explanation of Assertion.
C. If Assertion is true but Reason is false.

D. If both Assertion and Reason are false.

Q.65 Assertion : Man has 23 linkage groups and fruit fly only 4.

Reason : Man has 46 chromosomes and fruit fly only 8.

- A. If both Assertion and Reason are true and reason is the correct explanation of Assertion.
- B. If both Assertion and Reason are true but reason is not the correct explanation of Assertion.
- C. If Assertion is true but Reason is false.
- D. If both Assertion and Reason are false.

Q.66 Assertion: In Honey Bee, female is diploid and male is haploid

Reason: gametes are formed by meiosis in female and by mitosis in male.

- A. If both Assertion and Reason are true and reason is the correct explanation of Assertion.
- B. If both Assertion and Reason are true but reason is not the correct explanation of Assertion.
- C. If Assertion is true but Reason is false.
- D. If both Assertion and Reason are false.

Q.67 Assertion: Haemophilia shows Criss-cross inheritance.

Reason: The gene that causes haemophilia is recessive and lies in the sex (X) chromosome.

- A. If both Assertion and Reason are true and reason is the correct explanation of Assertion.
- B. If both Assertion and Reason are true but reason is not the correct explanation of Assertion.
- C. If Assertion is true but Reason is false.
- D. If both Assertion and Reason are false.

Q.68 Assertion: In humans, red-green colour blindness is due to an X-linked dominant gene.

Reason: The father transmits his gene for colour blindness to a son not to a daughter.

- A. If both Assertion and Reason are true and reason is the correct explanation of Assertion.
- B. If both Assertion and Reason are true but reason is not the correct explanation of Assertion.
- C. If Assertion is true but Reason is false.
- D. If both Assertion and Reason are false.

Q.69 Assertion: A Turner syndrome individual would be expected to have no Barr body.

Reason: Her sex chromosome constitution is XO.

- A. If both Assertion and Reason are true and reason is the correct explanation of Assertion.
- B. If both Assertion and Reason are true but reason is not the correct explanation of Assertion.
- C. If Assertion is true but Reason is false.
- D. If both Assertion and Reason are false.

CCT (CASE STUDIES)

Q.70 Read the following and answer the questions from 70(i) to 70 (v) given below:

Sickle cell anemia is a genetic disorder where the body produces an abnormal hemoglobin called

hemoglobin S. Red blood cells are normally flexible and round, but when the hemoglobin is defective, blood cells take on a “sickle” or crescent shape. Sickle cell anemia is caused by mutations in a gene called HBB.

It is an inherited blood disorder that occurs if both the maternal and paternal copies of the HBB gene are defective. In other words, if an individual receives just one copy of the defective HBB gene, either from mother or father, then the individual has no sickle cell anemia but has what is called “sickle cell trait”. People with sickle cell trait usually do not have any symptoms or problems but they can pass the mutated gene onto their children. There are three inheritance scenarios that can lead to a child having sickle cell anemia:

- Both parents have sickle cell trait
- One parent has sickle cell anemia and the other has sickle cell trait

Both parents have sickle cell anemia

(i) Sickle cell anemia is a/ an _____ disease.

- (a) X linked
- (b) Autosomal dominant
- (c) Autosomal recessive
- (d) Y linked

(ii) If both parents have sickle cell trait, then there is _____ of the child having sickle cell anemia.

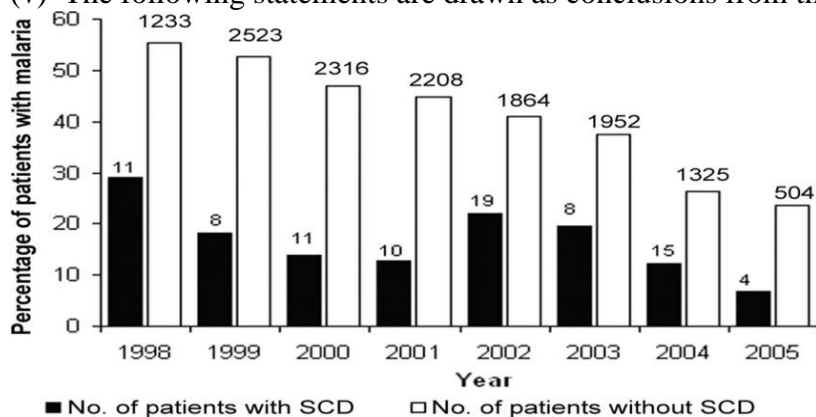
- (a) 25 % risk
- (b) 50 % risk
- (c) 75% risk
- (d) No risk

(iii) If both parents have sickle cell trait, then there is _____ of the child having sickle cell trait.

- (a) 25 % risk
- (b) 50 % risk
- (c) 75% risk
- (d) No risk

(iv) If one parent has sickle cell anemia and the other has sickle cell trait, there is _____ their children will have sickle cell anemia and _____ will have sickle cell trait.

- (a) 25 % risk, 75% risk
- (b) 50 % risk, 50% risk
- (c) 75% risk, 25% risk
- (d) No risk
- (v) The following statements are drawn as conclusions from the above data (Kenya).



- I. Patients with SCD (Sickle Cell Disease) are less likely to be infected with malaria.
- II. Patients with SCD (Sickle Cell Disease) are more likely to be infected with malaria.
- III. Over the years the percentage of people infected with malaria has been decreasing.
- IV. Year 2000 saw the largest percentage difference between malaria patients with and without SCD

Choose from below the correct alternative.

- (a) only I is true
- (b) I and IV are true
- (c) III and II are true
- (d) I and III are true

Q.71 Read the following and answer the questions from 71 (i) to 71 (v) given below:

This is also an autosome -linked recessive blood disease transmitted from parents to the offspring when both the partners are unaffected carrier for the gene (or heterozygous). The defect could be due to either mutation or deletion which ultimately results in reduced rate of synthesis of one of the globin chains (α and β chains) that make up haemoglobin.

This causes the formation of abnormal haemoglobin molecules resulting into anaemia which is characteristic of the disease. Thalassaemia can be classified according to which chain of the haemoglobin molecule is affected. In α Thalassaemia, production of α globin chain is affected while in β Thalassaemia, production of β globin chain is affected. α Thalassaemia is controlled by two closely linked genes HBA1 and HBA2 on chromosome 16 of each parent and it is observed due to mutation or deletion of one or more of the four genes.

The more genes affected, the less alpha globin molecules produced. While α Thalassemia is controlled by a single gene HBB on chromosome 11 of each parent and occurs due to mutation of one or both the genes. Thalassemia differs from sickle-cell anaemia in that the former is a quantitative problem of synthesising too few globin molecules while the latter is a qualitative problem of synthesising an incorrectly functioning globin.

(i) This statement is true about Thalassemia

- (a) There is a type of thalassemia depending on the number of mutations in genes
- (b) It is caused by mutations in the DNA of cells which make up the haemoglobin
- (c) Mild thalassemia may not need treatment
- (d) All of these

(ii) Treatment that can be given to thalassemia patients

- (a) Stem cell or bone marrow transplant
- (b) Blood transfusions
- (c) Iron chelation
- (d) All of the above

(iii) Factors leading to an increase in the risk of thalassemia disease

- (a) Certain ancestry
- (b) Family history of thalassemia
- (c) Only B
- (d) Both A and B

(iv) This about alpha-thalassemia is correct

- (a) Number of gene mutations decide the severity of the condition
- (b) Haemoglobin fails to produce enough alpha protein in alpha-thalassemia
- (c) Alpha-thalassemia is common in South-east Asia, southern Asia, India etc
- (d) All of the above

(v) This about beta-thalassemia is true

- (a) two genes are necessary to make beta-globin chains
- (b) Mutation of genes decide the severity of the condition
- (c) Beta thalassemia is a common condition in West Asia, North Africa and the Mediterranean islands
- (d) All of these

72 Read the following paragraph and answer the questions from 72 (i) to (vii)

To identify whether an organism exhibiting a dominant trait is homozygous or heterozygous for a specific allele, a scientist can perform a test cross. The organism in question is crossed with an organism that is homozygous for the recessive trait, and the offspring of the test cross are examined. If the test cross results in any recessive offspring, then the parent organism is heterozygous for the allele in question. If the test cross results in only phenotypically dominant offspring, then the parent organism is homozygous dominant for the allele in question.

(i) A test cross is carried out to

- (a) Predict whether two traits are linked
- (b) Assess the number of alleles of a gene
- (c) Determine the genotype of F_2 plants
- (d) determine whether two species or varieties will breed successfully

(ii) A white colour flower is found to be dominant over violet colour flower. The genotype of white flower can be determined by

(a) Back cross (b) test cross (c) monohybrid cross (d) dihybrid cross

(iii) **Assertion:** Cross of F_1 individual with recessive homozygous parent is test cross.

Reason: No recessive individual is obtained in the monohybrid test cross

(a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
(b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
(c) If Assertion is correct but Reason is incorrect.
(d) If both the Assertion and Reason are incorrect

(iv) A cross was made between two plants. The resultant offspring carries 50% dominant phenotypic character (T) and 50% recessive phenotypic character (t). What would be the genotype of parents?

(a) $Tt \times Tt$ (b) $Tt \times tt$ (c) $TT \times Tt$ (d) $TT \times tt$

(v) Test cross is crossing between

- (a) Genotype with dominant trait
- (b) Genotype with recessive trait
- (c) F_1 hybrid with double recessive
- (d) Two F_1 hybrids

(vi) Genotype of hybrid is determined by

- (a) Crossing one F_1 progeny with recessive parent
- (b) Crossing one F_1 progeny with another F_1 progeny
- (c) Crossing one F_1 progeny with female parent
- (d) Crossing one F_1 progeny with male parent

(vii) Mating of an organism to a double recessive in order to determine whether it is homozygous or heterozygous for a character under consideration is called

- (a) reciprocal cross (b) test cross (c) dihybrid cross (d) back cross

73. Read the following and answer any four questions from 73 (i) to 1(v) given below:

47 A biologist wanted to find the genotype of a pea plant bearing purple colored flowers in his kitchen garden. For this, he crossed purple flowered plant with white flowered plant. As a result, all plants which were produced had purple flower only. Upon selfing these plants, 75 purple flower plants and 25 white flower plants were produced. Now, he can determine the genotype of a purple flowered plant by crossing it with a white flowered plant.

(i) Which of the following cannot be derived from the crosses done by biologist?

- (a) Mendel's law of segregation
- (b) Mendel's law of dominance
- (c) Mendel's law of independent assortment
- (d) Both (a) and (c)

(ii) To determine the genotype of a purple flowered plant, he crossed this plant with a white flowered plant. This cross represents a

- (a) test cross
- (b) dihybrid cross
- (c) reciprocal cross
- (d) trihybrid cross

(iii) In white flowered plant, allele is expressed in

- (a) heterozygous condition only
- (b) homozygous condition only
- (c) F₃, generation
- (d) both homozygous and heterozygous condition.

(iv) The character, i.e., purple colour of the flowers that appeared in the first generation is called

- (a) recessive character
- (b) dominant character
- (c) holandric character
- (d) lethal character.

(v) Assertion: A geneticist crossed two plants and he obtained 50% purple flowered plants and 50% white flowered plants.

Reasons: Purple coloured flower plant might be heterozygous.

- (a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
- (b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
- (c) If Assertion is correct but Reason is incorrect.
- (d) If both the Assertion and Reason are incorrect.

74 Read the following and answer any four questions from 74 (i) to (v) given below: According to Mendel, one gene controls the expression of one character only. The ability of a gene to have multiple phenotypic effect because it influences a number of characters is an exception. The gene having a multiple phenotypic effect because of its ability to control of two or more characters can be seen in cotton. In cotton, a gene for the lint also influences the height of plant, size of the ball, number of ovules and viability of seeds.

(i) Genes with multiple phenotypic effects are known as

- (a) hydrostatic genes

- (b) duplicate genes
- (c) complimentary genes.
- (d) pleiotropic genes

(ii) Which of the following disorder is an example of genes with multiple phenotypic effects?

- (a) Phenylketonuria
- (b) Haemophilia
- (c) Sickle cell anaemia
- (d) Both (a) and (c)

(iii) Which of the following is an example of gene with multiple phenotypic effect?

- (a) Drosophila white eye mutation
- (b) Kernel colour in wheat
- (c) Height in human beings
- (d) Skin colour in human beings

(iv) Which of the following statements is not correct regarding genes with multiple phenotypic effect?

- (a) It is not essential that all the traits are equally influenced.
- (b) Occasionally a number of related changes are caused by a gene.
- (c) It occurs due to effect of the gene on two or more inter-related metabolic pathways.
- (d) None of these
- (v) Assertion: In a garden pea plant, the gene which controls the flower colour also controls the colour of seed coat and presence of red spots on leaf axil.

Reason: A pleiotropic gene influences more than one character.

- (a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
- (b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
- (c) If Assertion is correct but Reason is incorrect.
- (d) If both the Assertion and Reason are incorrect.

75 Read the following and answer any four questions from 75 (i) to (v) given below: In a plant species that follows Mendelian inheritance yellow flower colour is dominant over white and round fruit shape is dominant over elongated. Crossing was performed between two pure lines-one having yellow flower and round fruit and another with white flower and elongated fruits. About 20 plants survived in F_1 progeny. Plants of F_1 were allowed to self-fertilize and about 960 plants survived in F_2 .

(i) How many plants would have yellow flower and round fruit in F_1 generation?

- (a) 20
- (b) 10
- (c) 5
- (d) 0

(ii) How many plants would have yellow flower and round fruit in F_2 generation?

- (a) 960
- (b) 540
- (c) 180
- (d) 60

(iii) Which of the following is correct for the condition when plant heterozygous for yellow flower and round fruit is back crossed with the double recessive parent?

- (a) 9:3:3:1 ratio of phenotype only
- (b) 9:3:3:1 ratio of genotype only
- (c) 1:1:1:1 ratio of phenotype only
- (d) 1:1:1:1 ratio of phenotype and genotype

(iv) When the plant heterozygous for yellow flower and round fruit are self crossed, then the plant with yellow flower and elongated fruit will be represented by the genotype

- (a) YyRr, YYRR, YYRr
- (b) Yyrr, YYrr, yyrr
- (c) yyRr, yyRR
- (d) Yyrr, YYrr.

(v) The represents in a yellow (R) white fruit (r)

♀ \ ♂	YR	Yr	yR	yr
YR	A	E	I	M
Yr	B	F	J	N
yR	C	G	K	D
yr	D	H	L	P

given Punnett's square the pattern of inheritance dihybrid cross where flower (Y) and round fruit condition is dominant over flower (y) and elongated condition.

Plant 'C' will produce fruits with the genotype identical to fruits produced by the plant of

- (a) type H
- (b) type E
- (c) type K
- (d) type I

Answer Key

1 (a)

2 (a)

3 (a) As per Mendel's law in F1 generation only dominant phenotypes appear

4 (c) Primary source of allelic variation is mutation.

5 (a) F1 generation is always heterozygous, e.g. TtRr, so there are 4 types of gamete formation i.e. TR, Tr, tR, tr

6 (b) The F2 generation will show the intermediate colour because of quantitative inheritance. In case of crossing between AA BB CC (dark colour) and aa bb cc (light colour), in F2 generation seven phenotypes will be obtained with ratio 1: 6: 15: 20: 15: 6: 1. The total number of progeny is 64, out of which only two will be likely resemble with either parents. Hence, their percentage in F2 generation would be 3.12 i.e. less than 5%

7 (b) In genetics, a test cross, first introduced by Mendel, is used to determine if an individual exhibiting a dominant trait is homozygous or heterozygous for that trait. Test crosses involve breeding the individual in question with another individual that expresses a recessive version of the same trait. If all offspring display the dominant phenotype, the individual in question is homozygous dominant; if the offspring display both dominant and recessive phenotypes, then the individual is heterozygous. In some sources, the "test cross" is defined as being a type of back cross between the recessive homozygote and F1 generation.

8 (a)

9 (a)

10 (a)

11 (b)

12 (b)

13 (b)

14 (c)

15 (d)

16 (c)

17 (b)

18 (a)

Ans 19. (b) 21

Ans 20. (d) Klinefelter's syndrome

Ans 21. (c) has 45 chromosomes with XO.

Ans 22.(e) In insects with XO type of sex determination, all sperms bear X-chromosome beside autosomes.

Ans 23 (b) holandric genes

Ans 24 (b) low phenylalanine and normal requirement of tyrosine

Ans 25 (a) Down's syndrome, Patau's syndrome, Edward's syndrome

Ans 26.(b) formation of abnormal ova in the mother.

Ans 27.(a) X-body

Ans 28.(c) Sickle Cell anaemia

Ans 29 (a) They always follow Criss-cross inheritance

Ans 30.(c) genome, chromosome, gene, nucleotide

Ans 31.(c) controls multiple traits in an individual

Ans 32.(a) T.H. Morgan

Ans 33.(c) Autosomal recessive

Ans 34 (c) (i),(ii) and (iii) are correct

Ans 35.(a) 0

Ans 36.(c) Translocation

Ans 37.(c)

Ans 38.(c)

Ans 39.(a)

Ans 40. (d)

Ans 41 (c)

42 (b)

43 (c)

44 (c)

45 (b)

46 (a)

47 (d)

48 (i) F_1 generation (ii) gene I (iii) I^A (iv) I^B (v) I (vi) diploid (vii) two (viii) phenotypic (ix) genotypic ratio (x) blending

49 (b)

50 (c)

51 (a)

52 (a)

53 (b)

54 (a)

55 (b)

56 (c)

57 (c)

58 (a)

59 (a)

60 (d)

61 (b)

62 (c)

63 (a)

Ans 64. A

Ans 65. A

Ans 66. B

Ans 67. A

Ans 68. D

Ans 69. A

Ans 70

(i). (c)

(ii). (a)

(iii). (b)

(iv). (b)

(v). (d)

Ans 71.

(i). (d)

(ii).

(d)

(iii) .(d)

(iv). (d)

(v). (d)

72 (i) (c) (ii) (a) (iii) (c) (iv) (b) (v) (c) vi (a) vii (b)

73 (i) (c) ii (a) iii (b) iv (b) v (a)

74 (i) (d) ii (d) iii (b) iv (d) v (a)

75 (i) (a) ii (b) iii (d) iv (d) v (d)

Chapter 6:

Molecular Basis of Inheritance

MCQs

Q1. In a DNA strand the nucleotides are linked together by

- (a) Glycosidic bonds
- (b) Phosphodiester bonds
- (c) Peptide bonds
- (d) Hydrogen bonds.

Q.2 DNA and RNA differ by:

- (a) Nitrogen base and Sugar
- (b) Nitrogen base and Phosphate group.
- (c) Numbers of C-atom in sugars
- (d) Sugar and Phosphate group

Q3. The total amount of adenine and thymine in a double stranded DNA is 45%. The amount of Guanine in this DNA would be.

- (a) 22.5%
- (b) 27.5%
- (c) 45%
- (d) 55%.

Q4. Okazaki fragments are associated with phenomenon

- (a) Translation
- (b) Transcription
- (c) Replication of DNA
- (d) Reverse transcription

Q. 5 A nucleoside differs from a nucleotide. It lacks the

- (a) Base
- (b) Sugar
- (c) Phosphate group
- (d) Hydroxyl group.

Q. 6 Both deoxyribose and ribose belong to a class of sugars called

- (a) Trioses
- (b) Hexoses
- (c) Pentoses
- (d) Polysaccharides

Q.7 The net electric charge on DNA and histones is

- (a) Both positive
- (b) Both negative
- (c) Both (a) and (b)
- (d) Zero

Q8. The fact that a purine always paired base through hydrogen bonds with a pyrimidine base

leads to, in the DNA double helix

- (a) The antiparallel nature

- (b) The semiconservative nature
- (c) Uniform width throughout DNA
- (d) Uniform length in all DNA.

Q9. Discontinuous synthesis of DNA occurs in one strand, because

- (a) DNA molecule being synthesised is very long
- (b) DNA dependent DNA polymerase catalyses polymerisation only in one direction (5' → 3')
- (c) It is a more efficient process
- (d) DNA ligase has to have a role

Q10. If Meselson and Stahl's experiment is continued for four generations in bacteria, the ratio of ^{15}N : ^{14}N : ^{15}N : ^{14}N containing DNA in the fourth generation would be

- (a) 1:1:0
- (b) 1:4:0
- (c) 0:1:3
- (d) 0:1:7

Q.11 DNA is a polymer of nucleotides which are linked to each other by 3'–5' phosphodiester

bond. To prevent polymerisation of nucleotides, which of the following modifications would you choose?

- (a) Replace purine with pyrimidines
- (b) Remove/Replace 3' OH group in deoxyribose
- (c) Remove/Replace 2' OH group with some other group in deoxy ribose
- (d) Both (b) and (c)

Q.12 In Griffith's experiment which of the following strains of pneumococci was isolated from dead mice?

- a) Live rough cells
- b) Dead rough cells
- c) Live smooth cells
- d) Dead smooth cells

Q.13 In the Griffith experiment, why did mice die when injected with live R bacteria plus heat

killed S bacteria? Some of the S bacteria were still alive.

- (a) The R bacteria had mutated to become virulent.
- (b) The R bacteria had taken up the virulence "factor" from the dead S bacteria.
- (c) The virulence "factor" in dead S bacteria was sufficient to kill the mice.
- (d) The mice died from a cause unrelated to pneumonia.

Q.14 Following Watson and Crick's experiments, the basis of DNA as the hereditary material of genes was confirmed by

- A. Fredrick Griffith
- B. Hershey and Chase
- C. Avery, Macleod and MacCarty
- D. Meselson and Stahl

Q.15. Select the correct match of enzyme with its related function.

- (a) DNA polymerase – Synthesis of DNA strands
- (b) Helicase – Unwinding of DNA helix
- (c) Ligase – Joins together short DNA segments
- (d) All of these

Q.16 The enzyme DNA dependent RNA polymerase catalyses the polymerisation reaction in _____ direction.

- (a) only $5' \rightarrow 3'$
- (b) only $3' \rightarrow 5'$
- (c) both (a) and (b)
- (d) none of these

Q.17. The Meselson-Stahl experiment demonstrated that DNA replication produces two DNA molecules each composed of

- (a) Two old strands
- (b) Two new strands
- (c) One old strand and one new strand
- (d) Two strands with variable proportions of new and old DNA.

Q.18. The enzyme involved in transcription

- (a) DNA Polymerase I
- (b) DNA Polymerase II
- (c) RNA Polymerase
- (d) DNA Polymerase

Q.19. The primary control of gene expression takes place at the level of

- (a) Translation
- (b) Replication
- (c) Transcription
- (d) None

Q.20. The gene sequence that codes for proteins are

- (a) Exons
- (b) Introns
- (c) Intervening sequences
- (d) Control regions

Q.21. Which non-radioactive isotope was used by Messelson and Stahl in their experiment?

- (a) P32
- (b) S35
- (c) N15
- (d) None

Q.22. Which enzyme is not produced during lactose catabolism by E.coli?

- (a) β -galactosidase
- (b) Lactose Permease
- (c) Thiogalactosidetransacetylase
- (d) Lactose dehydrogenase

Q.23. The DNA site where DNA-dependent RNA- polymerase binds for transcription, is called

- (a) operator
- (b) promotor
- (c) regulator
- (d) receptor

Q.24. Eukaryotic RNA polymerase III catalyses the synthesis of

- (a) mRNA
- (b) rRNA
- (c) hnRNA
- (d) tRNA

Q.25. In the lac operon of E.coli, the i gene codes for

- (a) inducer

- (b) repressor
- (c) lactase
- (d) β -galactosidase

Q.26. Which of the following sets of codons contains only termination codons?

- (a) UAA, UGA, UAG
- (b) UAA, UUU, UGG
- (c) UAA, UAG, UAC
- (d) UUU, UCC, UGG

Q.27. What is the position of promoter site and the terminator site in a structural gene of a transcriptional unit

- (a) 3' (downstream) end and 5' (upstream) end, respectively of the transcription unit.
- (b) 5' (upstream) end and 3' (downstream) end, respectively of the transcription unit.
- (c) the 5' (upstream) end.
- (d) the 3' (downstream) end.

Q.28.. The human chromosome with the highest and least number of genes in them are respectively [NCERT Exemplar]

- (a) Chromosome 21 and Y
- (b) Chromosome 1 and X
- (c) Chromosome 1 and Y
- (d) Chromosome X and Y

Q.29..Sigma factor is a component of

- (a) DNA ligase
- (b) DNA polymerase
- (c) Endonuclease
- (d) RNA polymerase

Q.30.The main function of tRNA with regards to protein synthesis is

- (a) Proofreading
- (b) Identifies amino acids and transports them to ribosomes
- (c) Inhibits protein synthesis
- (d) all of the above.

Q.31. A DNA sequence is read by an RNA polymerase that produces complementary antiparallel RNA strand known as

- (a) Hexa transcript
- (b) secondary transcript
- (c) primary transcript
- (d) tertiary transcript

Q.32. AGGTATCGCAT is a sequence from the coding strand of a gene. What will be the corresponding sequence of the transcribed mRNA?

- (a) UGGTUTCGCAT
- (b) AGGUAUCGCAU

(c) ACCUAUGCGAU

(d) UCCAUAAGCGUA

Q.33. Expressed Sequence Tags (ESTs) refers to:

(a) Genes expressed as RNA

(b) Polypeptide expression

(c) DNA polymorphism

(d) Novel DNA sequences

Q.34. According to HGP, genetic similarity between all humans is

(a) 90%

(b) 99%

(c) 99.5%

(d) 99.9%

Q.35.. Which of the following vectors are commonly used in HGP?

(a) Plasmid and cosmid

(b) lambda phage and M13 vectors

(c) Phagemid and shuttle vectors

(d) BAC and YAC

Q36. The amino acid attaches to the tRNA at its

(a) 5' - end

(b) 3' – end

(c) anticodon site

(d) DHU loop.

Q.37.. In E. coli, the lac operon gets switched on when:

(a) lactose is present and it binds to the repressor

(b) repressor binds to operator

(c) RNA polymerase binds to the operator

(d) lactose is present and it binds to RNA polymerase.

Q.38. Polycistronic messenger RNA (mRNA) usually occurs in

(a) bacteria

(b) prokaryotes

(c) eukaryotes

(d) both (a) and (b)

ASSERTION REASON

In the following questions, a statement of assertion is followed by a statement of reason.
Mark the correct choice as:

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

Q 1..Assertion : In a DNA molecule, A–T rich parts melt before G–C rich parts.

Reason : In between A and T there are three H–bond, whereas in between G and C there are two H-bonds.

Q2. Assertion: Adenine cannot pair with cytosine.

Reason: Adenine and cytosine do not have a perfect match between hydrogen donor and hydrogen acceptor sites. Hence, they cannot pair.

Q 3. Assertion: The sugar phosphate backbone of two chains in DNA double helix show anti-parallel polarity.

Reason: The phosphodiester bonds in one strand go from a 3' carbon of one nucleotide to a 5' carbon of adjacent nucleotide, whereas those in complementary strand go vice versa.

Q 4. Assertion: DNA is considered to be better genetic material than RNA for most organisms.

Reason: 2'-OH group present in DNA makes it labile and less reactive.

Q.5Assertion: Histones are basic in nature.

Reason: Histones are rich in the amino acids lysine and arginine.

Q 6 Assertion: In Griffith's experiment, a mixture of heat-killed virulent bacteria R and live non-virulent bacteria S, lead to the death of mice.

Reason: 'Transforming principle' got transferred from heat killed R strain to S strain and made it virulent.

Q 7 Assertion: The uptake of DNA during transformation is an active, energy requiring process.

Reason: Transformation occurs only in those bacteria, which possess the enzymatic machinery involved in the active uptake and recombination.

Q8. Assertion: Replication on one strand of DNA is continuous and on another is discontinuous.

Reason:The DNA polymerase works in 3' to 5' direction.

Q9. Assertion: The mechanism of DNA replication is semiconservative in nature.

Reason: Each of the complementary strands of the parental double helix is conserved during the process..

Q 10. Assertion: One of the two strands of DNA is called sense strand and other is called antisense strand.

Reason: Sense strand of DNA forms complementary RNA.

Q 11.Assertion: The nitrogen bases of the two chains of DNA are held together by hydrogen bonds.

Reason: Both chains of DNA are antiparallel.

Q 12. Assertion: A single mRNA strand is capable to produce different polypeptide chains.

Reason: The mRNA strand has terminator codons.

A

B

C

D

Q13. **Assertion** Initiation step of protein synthesis in prokaryotes and eukaryotes has several differences.

Reason: They both form mRNA - tRNA complex with smaller subunit of ribosome.

A

B

C

D

Q14. **Assertion.** Replication and transcription occurs in the nucleus but translation occurs in the cytoplasm.

Reason. mRNA is transferred from the nucleus into the cytoplasm where ribosomes and amino acids are available for protein synthesis.

A

B

C

D

Q15. **Assertion.** Lac Operon is a repressible operon.

Reason. The product of the gene activity stops the activity of the said gene.

A

B

C

D

Q16. **Assertion:** Repetitive sequences make up very large portion of human genome.

Reason : Repetitive sequences do not have direct coding functions in the genome.

A

B

C

D

Q17. **Assertion :** Polycistronic mRNA found in prokaryotes, specify a number of polypeptides.

Reason: Monocistronic mRNA, found in eukaryotes specify only a single polypeptide.

A

B

C

D

Q18. Assertion : DNA fingerprinting is very useful in forensic sciences.

Reason: It is a method in which individual pattern of DNA fragments is determined through the

number and position of specific repeated sequences.

A

B

C

D

Q19. Assertion : BAC and YAC are the common vectors used in HGP.

Reason: In HGP sequencing was done by automated DNA sequencers that worked on the methods of F.Sanger.

A

B

C

D

Q20. Assertion: Lac Operon model is applicable only to E.Coli.

Reason : E.Coli lacks a definite nucleus.

A

B

C

D

CASE STUDY BASED

Q.1.Read the following and answer any four questions from (i) to (v) given below: In prokaryotes, DNA is circular and present in the cytoplasm but in eukaryotes, DNA is linear and mainly confined to the nucleus. DNA or deoxyribonucleic acid is a long polymer of nucleotides. In 1953, the first correct double helical structure of DNA was worked out by Watson and Crick. Based on the X-ray diffraction data produced by Maurice Wilkins and Rosalind Franklin. It is composed of three components, i.e., A phosphate group, a deoxyribose sugar and a nitrogenous base. Different forms of DNA are B-DNA, Z-DNA, A-DNA, C-DNA and D-DNA.

(i) Name the linkage present between the nitrogen base and pentose sugar in DNA.

- (a) Phosphodiester bond
- (b) Glycosidic bond
- (c) Hydrogen bond
- (d) None of these

(ii) The double helix structure of DNA was proposed by

- (a) James Watson and Francis Crick
- (b) Earwin Chargaff
- (c) Federick Griffith
- (d) Hershey and Chase.

(iii) The double chain of B-DNA is coiled in a helical fashion. The spiral twisting of B-DNA duplex produces

- (a) right and left part
- (b) major and minor grooves
- (c) upper and lower sides
- (d) linear and circular part.

(iv) Assertion: The two strands of DNA helix have uniform distance between them.

Reason: A large sized purine always paired opposite to a small sized pyrimidine.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
- (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Both assertion and reason are false.

Q.2 Read the following and answer any four questions from (i) to (v) given below: DNA replication is a complex multistep process that requires enzymes, protein factors and metal ions. DNA replication in eukaryotes occurs in the nucleus during the S-phase of the cell cycle. It is semidiscontinuous in eukaryotes. In prokaryotes, replication takes place in the cytoplasm. DNA replication in bacteria occurs prior to fission. Nucleoid or viral chromosome is a single molecule of nucleic acid, it may be linear or circular. Nucleic acid in a virus is either DNA or RNA but never both.

(i) In viral DNA, how many origin of replication are present?

- (a) Single
- (b) Twice
- (c) Multiple
- (d) None

(ii) Select the main enzyme involved in DNA replication.

- (a) DNA ligase
- (c) Topoisomerase
- (b) DNA dependent DNA polymerase
- (d) Helicase

(iii) Read the given statement and select the option that correctly fill in the blanks.

Enzyme (i) acts over the Ori site and unwinds the two strands of DNA by destroying (ii) bonds.

- (a) (i)-Helicase, (ii) Glycosidic
- (b) (i)-Helicase, (ii)-Hydrogen
- (c) (i)-Unwindase, (ii)-Phosphodiester
- (d) (i)-Unwindase, (ii)-Glycosidic

(iv) DNA strand, built up of Okazaki fragments is called

- (a) lagging strand
- (b) leading strand
- (c) complementary strand
- (d) parental strand.

Q3. DNA fingerprinting is a technique of determining nucleotide sequences of certain areas of DNA which are unique to each individual. Each person has a unique DNA fingerprint. Each

fingerprint is the same for every cell, tissue and organ of a person. DNA fingerprinting is the basis of paternity testing in case of disputes.

- I. The technique developed to identify a person with the help of DNA restriction analysis is known as
 - (a) DNA profiling
 - (b) DNA fingerprinting
 - (c) RFLP
 - (d) both (a) and (b).
- II. For DNA fingerprinting, DNA is obtained from
 - (a) Blood
 - (b) hair root cells
 - (c) semen
 - (d) all of these.
- III. During DNA fingerprinting, the radioactive probes
 - (a) Hybridize with DNA sample to form double stranded structure.
 - (b) Degrade the DNA
 - (c) Create positive charge on DNA
 - (d) Cut the DNA at various sites.
- IV. In India, DNA fingerprinting technique was developed by:
 - (a) Dr. Lalji Singh
 - (b) Alec Jeffreys
 - (c) Dr. Khorana
 - (d) none of these.
- V. Which of the following is true about DNA fingerprinting:
 - (a). VNTR is used as probe.
 - (b). DNA samples are loaded on agarose gel electrophoresis.
 - (c). It is based on the identification of nucleotide sequence present on the DNA molecule.
 - (d) All the above.

Answer Key

Simple MCQs

1.B	2.A	3.B	4.C	5.C	6.C	7.C	8.C	9.B	10.D
11.B	12.C	13.B	14.C	15.D	16.A	17.C	18.C	19.C	20.A
21.C	22.D	23.B	24.D	25.B	26.A	27.B	28.C	29.D	30.B
31.C	32.B	33.A	34.D	35.D	36.B	37.B	38.D		

ASSERTION REASON

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

CASE STUDY BASED

1.(i) b. (ii) a. (iii) b. (iv) b	2. (i) a. (ii) b. (iii) b. (iv) a.	3.(i) d. (ii) d. (iii) a. (iv) a. (v) d.
----------------------------------	------------------------------------	------------------------------------------