

D.A.V. REGIONAL TRAINING CENTRE CHATTISGARH
(UNDER THE AEGIS OF DAV CAE, DAV CMC, NEW DELHI)

MULTIPLE CHOICE QUESTION BANK

[M C Q]

TERM – I

Class - XII

Subject- Biology [044]

Based on Latest CBSE Exam Pattern for the Session 2021-22

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STUDY MATERIAL TERM-I

2021-2022

CLASS-XII

SUBJECT-BIOLOGY (044)

S.NO.	CHAPTER NO	CHAPTER	PAGE NO.
1	2	SEXUAL REPRODUCTION IN FLOWERING PLANTS	
2	3	HUMAN REPRODUCTION	
3	4	REPRODUCTIVE HEALTH	
4	5	PRINCIPLES OF INHERITANCE AND VARIATION	
5	6	MOLECULAR BASIS OF INHERITANCE	

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CHAPTER -2: SEXUAL REPRODUCTION IN FLOWERING PLANTS

	MCQs	
1	<p>While planning for an artificial hybridisation programme involving dioecious plants, which of the following steps would not be relevant?</p> <p>(i) Bagging of female flower (ii) Dusting of pollen on stigma (iii) Emasculation (iv) Collection of pollen.</p> <p>ANSWER-(iii) Emasculation</p>	
2	<p>From among the situations given below, choose the one that prevents both autogamy and geitonogamy.</p> <p>(i) Monoecious plant bearing unisexual flowers (ii) Dioecious plant bearing only male or female flowers (iii) Monoecious plant with bisexual flowers (iv) Dioecious plant with bisexual flowers.</p> <p>ANSWER-(ii) Dioecious plant bearing only male or female flowers</p>	

3	<p>In an embryo sac, the cells that degenerate after fertilisation are:</p> <p>(i) Synergids and primary endosperm cell. (ii) Synergids and antipodals. (iii) Antipodals and primary endosperm cell. (iv) Egg and antipodals.</p> <p>ANSWER-(ii) Synergids and antipodals.</p>
4	<p>In a fertilised embryo sac, the haploid, diploid and triploid structures are:</p> <p>(i) Synergid, zygote and primary endosperm nucleus. (ii) Synergid, antipodal and polar nuclei. (iii) Antipodal, synergid and primary endosperm nucleus. (iv) Synergid, polar nuclei and zygote.</p> <p>ANSWER-(i) Synergid, zygote and primary endosperm nucleus.</p>
5	<p>During microsporogenesis, meiosis occurs in :</p> <p>(i) Endothecium (ii) Microspore mother cells (iii) Microspore tetrads (iv) Pollen grains.</p> <p>ANSWER-(ii) Microspore mother cells</p>
Assertion and Reason type questions-	
<p>Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:</p> <p>(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</p>	
1	<p>Assertion : Autogamy is a transfer of pollen grains from an anther to the stigma of the same flower on the same plant. Reason : Xenogamy is pollination between two flowers on different plants.</p> <p>ANSWER-(C)</p>
2	<p>Assertion : Insects visit flower to gather honey. Reason : Attraction of flowers prevents the insects from damaging other parts of the plant.</p>

	ANSWER-(D)	
3	<p>Assertion: Pollen grains from male parent are mostly transferred to the stigma in the female parent by some external agency. Reason: This is because the male flowers or male organs have no internal device to reach the female organs in another flower.</p> <p>ANSWER-(A)</p>	
4	<p>Assertion: Hydrophily is a major mode of pollination in most of the aquatic plants in angiosperms. Reason: Almost all the aquatic dicot and monocot plants require water for the transport of male gametes and for fertilisation.</p> <p>ANSWER-(D)</p>	
5	<p>Assertion: Exine of a pollen grain is made up of sporopollenins which are resistant to high temperatures, strong acids or alkali as well as enzymatic degradation. Reason: Sporopollenins are absent in the region of germ pores.</p> <p>ANSWER-(B)</p>	
	Case Study based questions-	
1	<p>Read the following and answer any four questions from (i) to (v) given below:A biology student Arun, read an article on apple being a false fruit. He asked his teacher about how fruit can be called false fruit and was explained about the development of fruits.</p> <p>(i) A true fruit is formed from (a) ovary (b) ovary and thalamus (c) ovary and calyx (d) ovary and receptacle</p> <p>ANSWER- (a) ovary</p> <p>(ii) Fruit is a (a) post fertilisation product of pistil (b) product of flower (c) body having seeds (d) product of ovary</p> <p>ANSWER-(d) product of ovary</p> <p>(iii) Parthenocarp is a fruit (a) formed from superior ovary (b) formed from inferior ovary (c) consisting of ripened ovary and thalamus (d) which does not possess seeds</p> <p>ANSWER-(d) which does not possess seeds</p> <p>(iv) A fruit when is constricted in between the seeds is (a) Regma (b) Samara (c) Lomentum</p>	

(d) Follicle

ANSWER-(c) Lomentum

(v) Schizocarpic fruit splits up into

- (a) Achenial fruit
- (b) Capsular
- (c) Schizocarpic
- (d) Drupe

ANSWER-(b) Capsular

2

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

The endosperm makes the main source of food for the embryo. Generally the endosperm nucleus divides after the division of the oospore, but in several cases the endosperm is formed to a great extent even before the first division of the oospore. There are three general types of endosperm formation: (a) nuclear type, (b) cellular type and (c) helobial type. The endosperm is usually triploid but haploid endosperm is also found. Endosperm may either be completely consumed by the developing embryo before seed maturation or it may persist in the mature seed.

(i) Haploid endosperm is found in

- (a) Pinus (b) cauliflower (c) sunflower (d) pea

ANSWER-(a) Pinus

(ii) Persistent endosperm is found in

P. Pea Q. Castor R. Bean S. Coconut T. Groundnut

- (a) Q and S (b) P and T (c) R, S and T (d) P, S and T

ANSWER-(a) Q and S

(iii) Milk of tender coconut represents.(i)

and the surrounding white coconut meal represents (ii).

(i)	(ii)
(a) cellular endosperm	free-nuclear endosperm
(b) free-nuclear endosperm	cellular endosperm
(c) helobial endosperm	cellular endosperm
(d) free-nuclear endosperm	helobial endosperm

ANSWER-

(b) free-nuclear endosperm	cellular endosperm
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(iv) If an endosperm cell of a gymnosperm contains 12 chromosomes, the number of chromosomes in each cell of the root will be

- a) 4 (b) 24 (c) 16 (d) 6

	<p>ANSWER-(b) 24</p> <p>(v) In angiosperms, normally after fertilisation</p> <p>(a) the zygote divides earlier than the primary endosperm nucleus</p> <p>(b) the primary endosperm nucleus divides earlier than the zygote</p> <p>(c) both the zygote and primary endosperm nucleus divide simultaneously</p> <p>(d) both the zygote and primary endosperm nucleus undergo a resting period.</p> <p>ANSWER-(b) the primary endosperm nucleus divides earlier than the zygote</p>	

1. SEED IS THE BASIS OF OUR AGRICULTURE. WHICH OF THE FOLLOWING ARE CRUCIAL FOR STORAGE OF SEEDS, AS FOOD, AND TO RAISE CROP IN THE NEXT SEASON

- A. DEHYDRATION
- B. DORMANCY
- C. VERMICULTURE
- D. BOTH 1 AND 2

ANSWER- D

2. THE STRUCTURE IN WHICH FEW LEAF PRIMORDIA AND SHOOT APEX OF MONOCOT EMBRYO REMAIN ENCLOSED IS

- A. COLEOPTILE
- B. COLEORHIZA
- C. EPIBLAST
- D. EPICOTYL

ANSWER-A

3. IN WHICH OF THE FOLLOWING BOTH AUTOGAMY AND GEITONOGAMY IS ABSENT

- A. MAIZE
- B. MANGO
- C. PAPAIA
- D. CASTOR

ANSWER- C

4. ABOUT WIND POLLINATION WHICH OF THE FOLLOWING IS INCORRECT

- A. LIGHT AND NONSTICKY POLLEN GRAINS
- B. WELL EXPOSED STAMENS
- C. FEATHERY STIGMA
- D. HIGHLY SCENTED FLOWERS

ANSWER- D

5. DURING EMBRYO SAC FORMATION HOW MANY NUCLEI OUT OF 8 GO THROUGH CYTOKINESIS OR WALL FORMATION

- A. ALL 8
- B. TWO
- C. SIX
- D. FOUR

ANSWER- C

ASSERTION REASON BASED QUESTIONS

1. ASSERTION: CELLS OF THE TAPETUM POSSESS DENSE CYTOPLASM AND GENERALLY HAVE MORE THAN ONE NUCLEUS.
REASON: THE ANTHOR AND THE FILAMENT ARE ATTACHED TOGETHER WITH THE HELP OF CONNECTIVE.
 2. ASSERTION: IN SOME SPECIES FLORAL REWARDS ARE IN PROVIDING SAFE PLACES TO LAY EGGS.
REASON: THE POLLINATION BY BIRDS IS CALLED MALACOPHILY.
 3. ASSERTION: POLLINATION GUARANTEE THE TRANSFER OF THE RIGHT TYPE OF POLLEN.
REASON: THE PISTIL DOES NOT HAVE THE ABILITY TO RECOGNISE THE POLLEN, WHETHER IT OF THE RIGHT TYPE OR OF THE WRONG TYPE.
 4. ASSERTION: APOMIXIS IS A FORM OF ASEXUAL REPRODUCTION THAT MIMICS SEXUAL REPRODUCTION.
REASON: OCCURRENCE OF MORE THAN ONE EMBRYO IN A SEED IS REFERRED TO AS POLYEMBRYONY.
 5. ASSERTION: IN SOME SEEDS SUCH AS BLACK PEPPER AND BEET, REMNANTS OF NUCELLUS ARE ALSO PERSISTANT AND THIS IS CALLED PERISPERM.
REASON: IN ANGIOSPERM, THE FRUIT IS THE FINAL PRODUCT OF SEXUAL REPRODUCTION.
- ANSWERS: 1- B 2- C 3- D 4- B 5- C

CASE STUDY-1

READ THE FOLLOWING AND ANSWER

APOMIXIS IS A MODE OF REPRODUCTION THAT DOES NOT INVOLVE FORMATION OF ZYGOTE THROUGH GAMETE FUSION. IN PLANTS, APOMIXIS COMMONLY MIMICS SEXUAL REPRODUCTION BUT PRODUCES SEEDS WITHOUT FERTILISATION. THERE ARE SEVERAL METHODS OF APOMICTIC DEVELOPMENT IN SEEDS. TWO COMMON ONES ARE RECURRENT AGAMOSPERMY AND ADVENTIVE EMBRYONY.

1. APOMIXIS IS A TYPE OF REPRODUCTION IN PLANTS IN WHICH
 - a. Fertilization does not take place
 - b. Male nucleus takes part in fertilization
 - c. Pollen fusion takes place
 - d. Generative nucleus takes part in fertilization

2. WHICH OF THE FOLLOWING STATEMENTS IS INCORRECT REGARDING RECURRENT AGAMOSPERMY
 - a. It is the formation of seed that has an embryo formed without meiosis and syngamy
 - b. All the cells of embryo sac are diploid
 - c. An embryo develops directly from a diploid cell other than egg like that of nucleus and integument
 - d. None of these
3. ADVENTIVE EMBRYONY IS FOUND IN
 - a. Citrus
 - b. Opuntia
 - c. Apple
 - d. Both a. and b.
4. FORMATION OF EMBRYO DIRECTLY FROM DIPLOID EGG WITHOUT FERTILISATION IS CALLED
 - a. Apospory
 - b. Diplospory
 - c. Polyembryony
 - d. Diploid parthenogenesis
5. IF ANY SOMATIC CELL OF SPOROPHYTE PRODUCES GAMETOPHYTE WITHOUT REDUCTION DIVISION ,IT IS CALLED
 - a. Parthenogenesis
 - b. Apogamy
 - c. Apospory
 - d. Amphimixis

ANSWERS

1 - a 2- c 3-d 4- d 5- c

Question 1.

Polygonum type of embryo sac is

- (a) 8 – nucleate, 7 – celled
- (b) 8 – nucleate, 8 – celled
- (c) 7 – nucleate, 7 – celled
- (d) 4 – nucleate, 3 – celled

Question 2.

Male and female flowers are present on different plants (dioecious) to ensure xenogamy, in

- (a) papaya
- (b) bottle gourd
- (c) maize
- (d) all of these.

Question 3.

Persistent nucellus is called as _____ and is found in _____.

- (a) perisperm, black pepper
- (b) perisperm, groundnut ‘

- (c) endosperm, black pepper
- (d) endosperm, groundnut

Question 4.

Polyembryony commonly occurs in

- (a) banana
- (b) tomato
- (c) potato
- (d) citrus.

Question 5.

If an endosperm cell of an angiosperm contains 24 chromosomes, the number of chromosomes in each cell of the root will be

- (a) 8
- (b) 4
- (c) 16
- (d) 24

Assertion-Reason type-5

Directions: 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.6.Assertion : Chasmogamous flowers require pollinating agents.

Reason : Cleistogamous flowers do not expose their sex organs.

Q.7. Assertion: Exine of a pollen grain is made up of sporopollenins which are resistant to high temperatures, strong acids or alkali as well as enzymatic degradation.

Reason: Sporopollenins are absent in the region of germ pores.

Q.8. Assertion: Geitonogamy is genetically similar to autogamy.

Reason: The pollen grains come from same plant.

Q.9. Assertion : Pollen mother cells (PMCs) are the first male gametophytic cells.

Reason : Each PMC gives rise to two pollens.

Q.10. Assertion: Hydrophily is a major mode of pollination in most of the aquatic plants in angiosperms.

Reason: Almost all the aquatic dicot and monocot plants require water for the transport of male gametes and for fertilisation.

Case study type-2

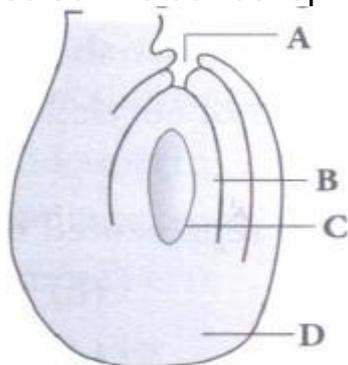
Read the following and answer the questions.

A typical angiospermic ovule is a small structure attached to the placenta by means of a stalk called funicle. The body of the ovule fuses with funicle in the region called hilum. Each ovule has one or two protective envelopes called integuments. Integuments encircle the nucellus except at the tip where a small opening called the micropyle is formed. Mature ovules are classified on the basis of funiculus. It can be orthotropous, anatropous, hemitropous, campylotropous, etc.

Q.11. Mature ovules are classified on the basis of funiculus. If micropyle lie close to the funiculus, the ovule is termed as

(a) orthotropous (b) anatropous (c) hemitropous (d) campylotropous

Q.12. Identify the parts labelled as A, B, C and D in the given figure and select the correct option



A	B	C	D
(a) Chalaza	Female gametophyte	Embryo sac	Micropyle
(b) Chalaza	Nucellus	Embryo sac	Micropyle
(c) Micropyle	Egg	Embryo sac	Chalaza
(d) Micropyle	Nucellus	Embryo sac	Chalaza

Answer key:

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

CASE STUDY 2

THE OVULE OR THE MEGASPORANGIUM DEVELOPS AS A SMALL PROTUBERANCE OF THE PLACENTAL TISSUE. IN THE VERY YOUNG OVULE , A SINGLE HYPODERMAL CELL IS DIFFERENTIATED AS THE ARCHESPORIUM. THIS ARCHESPORIUM CELL MAY OR MAY NOT CUT OFF SOME PARIETAL CELL AND THEN BECOME THE MEGASPORE MOTHER CELL(MMC). THE MMC UNDERGOES DIVISION TO FORM MEGASPORE CELLS. MEANWHILE TWO INTEGUMENTS DEVELOP FROM THE BASE OF THE OVULE.

1. WHICH OF THESE CELLS IS THE LARGEST CELL OF THE OVULE?
 - a. Antipodal cell
 - b. Central cell
 - c. Megaspore mother cell
 - d. None of these
2. IN ANGIOSPERMS , MICROSPOROGENESIS
 - a. Involve meiosis
 - b. Occur in ovule
 - c. Occur in anther
 - d. Form gametes without further divisions
3. MEGASPOROGENESIS IS THE
 - a. Formation of fruits
 - b. Formation of seeds
 - c. Formation of megaspores
 - d. Both b and c
4. MEGASPORE MOTHER CELL IS FOUND NEAR THE REGION OF
 - a. Micropyle
 - b. Chalaza
 - c. Nucellus
 - d. Integuments

ANSWERS

1- c 2- c 3- c 4- a

1. Perisperm is-

- (a) Degenerate secondary nucleus
- (b) Remnant of nucleus
- (c) Peripheral part of endosperm
- (d) Degenerate synergids

2. Which of the following fruit is a case of parthenogenesis?

- (a) Fruit without seeds after pollination
- (b) Fruit with seeds after pollination
- (c) Fruit with viable seeds without fertilization
- (d) Fruit with viable seeds after fertilization.

3. If an endosperm cell of an angiosperm has 24 chromosomes, the root cell of megaspore mother cell should have-

- (a) 8
- (b) 16
- (c) 4
- (d) 24

4. How many meiotic divisions are needed for forming 100 grains of wheat?

- (a) 100
- (b) 25
- (c) 50
- (d) 20

5. Aleurone layer is present in

- (a) The peripheral part of scutellum
- (b) The peripheral part of coleoptile
- (c) Cotyledons
- (d) The peripheral part of endosperm.

6. Which is the most logical sequence with reference to life cycle of angiosperm?

- (a) Pollination, fertilization, seed formation, germination
- (b) Germination, endosperm formation, seed dispersal, double fertilization
- (c) Cleavage, fertilization, grafting, fruit formation
- (d) Maturation, mitosis, differentiation, fertilization.

7. Sporopollenin is secreted by

- (a) Cytoplasm of the pollen
- (b) Cytoplasm of the pollen mother cell
- (c) Cytoplasm of the tapetum
- (d) Cytoplasm of the endothecium

8. Which one of these tissues is not produced from the embryonic mass of a dicotyledonous seeds?

- (a) Root tip
- (b) Plumule
- (c) Hypocotyl
- (d) Cotyledons

9. If the flowering plant has 12 number of chromosomes in each of its meristematic cell, which of the following structures would have 6 chromosomes?

- (a) Root apex
- (b) Pollen and megaspore mother cells
- (c) Microspore and functional megaspores
- (d) Secondary nucleus within the embryo.

10. The development of helobial endosperm is

- (a) Just like that of cellular endosperm
- (b) Exactly similar to that of nuclear endosperm
- (c) Intermediate between the nuclear and cellular endosperm
- (d) None of the above.

11. Embryo sac of an angiosperm is homologous to

- (a) Megaspore
- (b) Female gametophyte
- (c) Sporangium
- (d) None of above.

12. Anthesis is-

- (a) Dehiscence of anthers
- (b) Opening of floral bud
- (c) Entry of pollen tube into ovule
- (d) Emergence of anthers

13. Entry of pollen tube through micropyle is called

- (a) Mesogamy
- (b) Pseudogamy
- (c) Chalazogamy
- (d) Porogamy.

14. The outermost and innermost wall layers of microsporangium in an anther are respectively

- (a) Endothecium and tapetum
- (b) Epidermis and endodermis
- (c) Epidermis and middle layer
- (d) Epidermis and tapetum.

15. In a fertilized embryo sac, the haploid, diploid and triploid structures are-

- (a) Synergid, zygote and primary endosperm nucleus
- (b) Synergid, antipodal and polar nuclei
- (c) Antipodal, synergid and primary endosperm nucleus
- (d) Synergid, polar nuclei and zygote

16. Milky water in green coconut is

- (a) Free nuclear Liquid endosperm
- (b) Liquid female gametophyte
- (c) Liquid nucleus
- (d) Liquid chalaza

17. A plant with both male and female flowers is

- (a) Unisexual
- (b) Bisexual

(C) Monoecious

(d) Dioecious.

18. Filiform apparatus occurs in

(a) Synergids

(b) Antipodals

(c) Egg nucleus

(d) Secondary nucleus.

19. A dicotyledonous plant bears flowers, but never produces fruits and seeds. The most probable cause for the above situation is

(a) plant is dioecious and bears only pistillate flowers

(b) plant is dioecious and bears both pistillate and staminate flowers

(C) plant is monoecious

(d) plant is dioecious and bears only staminate flowers

20. 256 microspores will form by the meiosis of-

(a) 512 microspore mother cells

(b) 128 microspore mother cells

C) 64 microspore mother cells

(d) 48 microspore mother cells

21. If a normal plant suddenly started reproducing parthenogenetically, the number of chromosomes of the second generation compared to the parent will be

(a) One-half

(b) One fourth

(c) Double

(d) Same.

22. In a flower, if the megaspore mother cell forms megaspores without undergoing meiosis and if one of the megaspores develops into an embryo sac, its nuclei would be

(a) Haploid

(b) Diploid

(C) A few haploid and a few diploid

(d) With varying ploidy

23. In an embryo sac, the cells that degenerate after fertilization are:

(a) Synergids and primary endosperm cell

(b) Synergids and antipodals

(c) Antipodals and primary endosperm cell

(d) Egg and antipodals,

24. In the embryos of a typical dicot and a grass, true homologous structures are:

(a) Coleorhiza and coleoptile

(b) Coleoptile and scutellum

(c) Cotyledons and scutellum

(d) Hypocotyl and radicle

25. While planning for an artificial hybridisation programme involving dioecious plants, which of the following step would NOT be relevant:

(a) Bagging of female flower

(b) Dusting of pollen on stigma

(c) Emasculation

(d) Collection of pollen.

26. Choose the correct statement from the following

(a) Cleistogamous flowers always exhibit autogamy

(b) Chasmogamous flowers always exhibit geitonogamy

(c) Cleistogamous flowers exhibit both autogamy and geitonogamy

(d) Chasmogamous flowers never exhibit autogamy

. 27. Autogamy can occur in a chasmogamous flower if

(a) pollen matures before maturity of ovule

(b) ovule matures before maturity of pollen

(c) both pollen and ovules mature simultaneously

(d) both anther and stigma are of equal lengths.

28. A particular species of plant produces light, non-sticky pollen in large numbers and its stigmas are long and feathery. These modifications facilitate pollination by

(a) insects

(b) water

(c) wind

(d) animals.

29. 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.

30. Starting from the innermost part, the correct sequence of parts in an ovule is

(a) egg nucellus, embryo sac, integument

(b) egg, embryo sac, nucellus, integument

(c) embryo sac, nucellus, integument, egg

(d) egg, integument, embryo sac, nucellus

Chapter -2 Answer MCQs

1-b 2-a 3-b 4-a 5-d 6-a 7-c 8-d 9-c 10-c 11-b 12-b 13-d 14-d 15-a 16-a 17-c 18-a 19-d 20-c 21-d 22-b 23-b 24-c 25-c 26-a 27-c 28-c 29-b 30-b

Assertion and Reasoning based Questions

(Question No. 31 to 40) In each of the following questions, a statement of Assertion is given followed by a corresponding statement of Reason just below it. Of the statements mark the correct answer as:

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

(b) Both Assertion and Reason are true and the reason is not the correct explanation of the Assertion.

(c) Both Assertion and Reason are true and the reason is the correct explanation of the Assertion.

(d) Both Assertion and Reason are true and the reason is the correct explanation of the Assertion.

31. Assertion. Maize is an albuminous seed.

Reason. Its endosperm is completely absorbed by its growing embryo.

32. Assertion. The megaspore mother cells divide by meiotic division to produce four spores.

Reason. Megaspore Mother Cells (MMC) are diploid and megaspores are haploid.

33. Assertion. 7-celled, 8 nucleate and monosporic embryo sac is Most common type of embryo sac in dicotyledonous plants.

Reason. It was discovered first time in plant *Polygonum*.

34. Assertion. Female gametophyte in angiosperm is eight nucleate.

Reason. Double fertilization occurs in angiosperms

35. Assertion. Parthenogenesis is an apomixis where seeds are developed from unfertilized female gamete.

Reason. Parthenogenesis always occurs by the application of chemicals.

36. Assertion. Pollen grains, in case of hydrophily, are covered by mucilaginous/oily layer.

Reason. Mucilaginous is a viscous sticky substance that protects the pollen from water.

37. Assertion. Exine of pollen grain is comprised of sporopollenin which is resistant to high temperature, strong acid or alkali.

Reason. Sporopollenin is absent in the region of germ pore

38. Assertion. In *Ophrys* one petal of the flower bears an uncanny resemblance to the female bee.

Reason. Two closely related species competing for the same resource can coexist simultaneously.

39. Assertion. Majority of insect-pollinated flowers are large, colourful, fragrant and rich in nectar.

Reason. Insects are attracted to flowers by colour, fragrance and or nectar.

40. Assertion. The continued self-pollination results in inbreeding depression.

Reason. The device to prevent self-pollination is the production of bisexual flowers.

[Answer Assertion and Reasoning based Questions](#) 31-c 32-d 33-c 34-b 35-c 36-a 37-b 38-c 39-a 40-c

Case Based Questions

1. Read the following and answer questions given below from (i) to (v) 5 In major approaches of crop improvement programme as in crossing experiments, it is important to make sure that only the desired pollen grains are used for pollination and the stigma is protected from contamination from unwanted pollens. So, if the female parent bears bisexual flowers, removal of anthers from the flower bud before the anther dehisces is necessary (Emasculation).

Emasculated flowers have to be covered with bags of suitable size to prevent contamination of their stigma with unwanted pollen-bagging. When the stigma of bagged flower attains receptivity, mature pollen grains collected from anthers of the male parent are dusted on the stigma and the flowers are re-bagged and the fruits are allowed to develop. If the female parent produces unisexual flowers, there is no need for emasculation.

(i) While planning for an artificial hybridisation involving dioecious plants, which of the following steps would not be relevant?

- (a) Bagging of female flower
- (b) Dusting of pollen on stigma
- (c) Emasculation
- (d) Collection of pollen

(ii) Assertion- If the female parent produces unisexual flowers, there is no need of emasculation

Reason- Emasculation is the removal of anthers from the flower bud before the anther dehisces.

(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 the assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

(iii) Artificial hybridization denotes to

(a) production of seedless fruits

(b) evolve seeds without fertilization

(C) crop improvement programme

(d) occurrence of more than one embryo in a

(iv) The correct sequence to perform artificial hybridization is

(a) Bagging-->Emasculation --> Re-bagging --> Cross pollination

(b) Emasculation -->Bagging-->Cross pollination--> Re-bagging

(c) Cross pollination--> Emasculation--> Bagging -->Re-bagging

(d) Bagging-->Re-bagging--> Cross pollination--> Emasculation seed

(v) Bagging technique in artificial hybridization approach is done

(a) To prevent contamination of stigma with unwanted pollens

(b) After the anthers have been dehisced

(c) Only in monoecious plants

(d) To promote production of apomixis.

Answer Case Based Questions

1 i-c ii-b iii-c iv-b v-a

2. Read the following and answer questions given below from (i) to (v) Pollen grains are generally spherical shaped and each is surrounded by two layers –

exine and intine. Exine is made up of sporopollenin which is resistant to high temperatures and strong acids and alkali. Sporopollenin remains absent at germ pores. Pollen grains are well preserved as fossils because of the presence of sporopollenin. The inner wall of pollen grain is intine. The pollen grains are mainly shed at 2-celled stage- vegetative cell and generative cell when they are matured. Pollen grains of many species cause severe allergies and bronchial afflictions, leading to chronic respiratory disorders. It is mentioned that Parthenium or carrot grass that came into India as contaminant with imported wheat, has become ubiquitous in occurrence and causes pollen allergy. However, pollen grains are rich in nutrients which are used pollen tablets as food supplements. In western countries, large number of pollen products in the form of tablets and syrups are available in the market which are claimed to increase the performance of athletes and race horses.

(i) Assertion- Sporopollinin is an oxidative polymer of carotenoids which helps in fossilization.

Reason- Sporopollinin is a tough substance that provides resistant to biological decomposition, high temperature and alkali.

(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 the assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

(ii) Which of the following statements is not appropriate for pollen grains

(a) Pollen grains can be stored for years in liquid nitrogen and can be used in crop breeding programmes,

(b) Pollen grains are rich in nutrients and can be used as pollen tablets as food supplements.

(c) Bee pollen are available in western countries in the form of tablets.

(d) Pollen consumption has potential inhibitory action which results in decreased energy in athletes and race horses.

(iii) Pollen allergy is common in many people during spring, summer and fall as plants release tiny pollen grains in tremendous quantity. Which of the following is not associated with pollen allergy?

- (a) Sneezing, stuffy nose and watery, eyes
 - (b) Asthma, bronchitis
 - (c) Cough, itchy nose, roof of mouth or throat
 - (d) Fever, diarrhoea and vomiting
- (iv) Which of the following set does not cause allergy?
- (a) Ragweed parthenium
 - (b) Sagebrush
 - (c) Amaranthes (pigweed)
 - (d) Acacia.
- (v) The function of germ pore in pollen grain is
- (a) Emergence of radicle
 - (b) Absorption of water for seed germination
 - (c) Initiation of pollen tube
 - (d) All of these

Answer Case Based Questions

2 i-a ii-d iii-d iv-d v-c

3. Read the following and answer questions given below from (i) to (V) A flower of tomato plant following the process of sexual reproduction produces 240 viable seeds. The viable seeds are those which have the ability to remain alive and may develop into plants and reproduce themselves in the given appropriate conditions. This happens when one of the pollen grain reaches to the stigma by any agency at 2-celled stage vegetative cell and generative cell. The generative cell divides mitotically and forms two male gametes which enters into ovule after passing through pollen tube and undergoes the process of double fertilization in the ovule. The ovule is a large parenchymatous body formed in the ovary by megasporogenesis. The megaspore mother cell in an ovule diploid structure which undergoes meiotic division and forms one functional megaspore. The megaspore undergoes three subsequent divisions and

forms 8 nuclei arranging themselves in 3 groups. After fertilization, the ovule converts into the seed and whole ovary develops into a complete fruit.

i) The minimum number of pollen grains that must have been involved in the pollination of its pistil are.....

- (a) 60
- (b) 120
- (c) 180
- (d) 240

(i) The minimum number of microspore mother cells must have undergone reductional division prior to dehiscence of anther are:

- (a) 60
- (b) 90
- (c) 180
- (d) 240

(iii) The male gametes that might have involved in this case are

- (a) 120
- (b) 240
- (c) 360
- (d) 480

(iv) The minimal number of ovules present in the ovary would be:

- (a) 60
- (b) 120
- (c) 180
- (d) 240

(v) Megaspore mother cells involved in this process are

- (a) 120
- (b) 180
- (c) 240

(d) 360

Answer Case Based Questions

3 i-d ii-a iii-d iv-d v-c

CHAPTER -3: HUMAN REPRODUCTION

QN.1 Antrum is cavity of

- A. Ovary
- B. Graffian follicle
- C. Blastula
- D. Gastrula

QN.2 In human females meiosis –II is not completed until

- A. puberty
- B. fertilization
- C. uterine implantation
- D. birth

QN.3 32 celled stage of human embryo is-

- A. larger than fertilized egg
- B. smaller than fertilized egg
- C. same size as fertilized egg
- D. four time larger than fertilized egg

QN.4 Sertoli cells are regulated by the pituitary hormones

- A. FSH
- B. LH
- C. Prolactin

D. Progesteron

QN.5 Sperm formed from one primary permatocyte number

A. 8

B. 4

C. 3

D. 1

ASSERTION AND REASON

Questions consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true but R is false

D. A is False but R is true

QN.1 Assertion: Lactational amenorrhea is the natural method of contraception.

Reason: It increases the phagocytosis of sperm.

QN.2 Assertion: Saheli, an oral contraceptive for females, contains a steroidal preparation.

Reason: It is a "once a week" pill with very few side effects.

QN.3 Assertion: Parturition is induced by a complex neuro endocrine mechanism.

Reason: At the end of gestation period, the maternal pituitary releases prolactin which causes uterine contraction

QN. 4 Assertion: In human male testes are extra abdominal and lie in scrotal

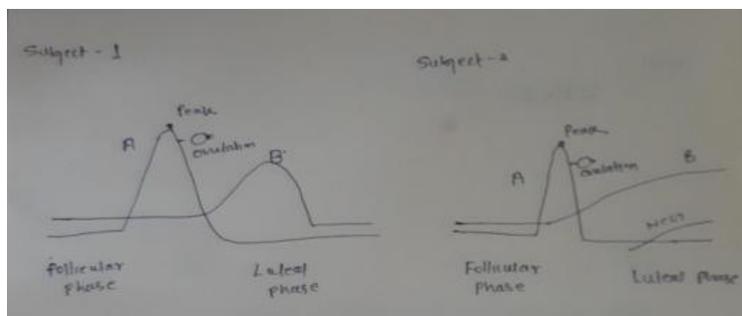
Reason: Scrotum acts as thermoregulator and keeps testicular temperature lower by 2°C normal spermatogenesis.

QN.5 Assertion: Urethra in human male acts as urinogenital canal.

Reason : Urethra carries only urine while sperm are carried by vasa deferentia only.

CASE STUDY-

CASE- To answer the questions study the graphs below for subject-1 and 2 showing different level of certain hormones.



QN.1 The peak observed in subject 1 and 2 due to

- A. Estrogen
- B. Progesteron
- C. Luteinizing hornone
- D. FSH

QN.2 Subject-2 has higher level of hormone B which is-

- A. Estrogen
- B. Progesteron
- C. LH
- D. FSH

ANSWERS.....

MCQ (1)B (2)B (3)C (4)A (5)B

ASS. AND REASON (1)C (2)D (3)C (4)A (5)C

CASE STUDY (1)C (2)B

Question 1. Ovulation in the human female normally takes place during the menstrual cycle

- (a) at the mid secretory phase
- (b) just before the end of the secretory phase

(c) at the beginning of the proliferative phase

(d) at the end of the proliferative phase.

Question 2. After ovulation Graafian follicle regresses into

(a) corpus atresia

(b) corpus callosum

(c) corpus luteum

(d) corpus albicans Question

3. Immediately after ovulation, the mammalian egg is covered by a membrane known as

(a) chorion

(b) zona pellucida

(c) corona radiata

(d) vitelline membrane.

Question 4. Which one of the following events is correctly matched with the time period in a normal menstrual cycle ?

(a) Release of egg: 5th day

(b) Endometrium regenerates: 5 – 10 days

(c) Endometrium secretes nutrients for implantation: 11 – 18days

(d) Rise in progesterone level: 1 – 15 days

Question 5. If mammalian ovum fails to get fertilised, which one of the following is unlikely ?

(a) Corpus luteum will disintegrate.

b) Progesterone secretion rapidly declines.

(c) Estrogen secretion increases.

(d) Primary follicle starts developing.

Question 6. A human female reaches menopause around the age of

- (a) 50 years
- (b) 15 years
- (c) 70 years
- (d) 25 years.

Question 7. A reaction of granules content which harden the zona pellucida and ensures sure block to polyspermy is

- (a) acrosomal reaction
- (b) cortical reaction
- (c) acrosin reaction
- (d) binding reaction.

Question 8. Which part of the sperm plays an important role in penetrating the egg membrane?

- (a) Allosome
- (b) Tail
- (c) Autosome
- (d) Acrosome

Question 9. In oocyte secondary maturation occurs in

- (a) ovary
- (b) abdominal cavity
- (c) Fallopian tube
- (d) uterus.

Question 10. Besides activating the egg another role of a sperm is to carry to egg

- (a)RNA
- (b) mitochondria
- (c)DNA

(d) ribosome:

Question 11. Preparation of sperm before penetration of ovum is

- (a) spermiation
- (b) cortical reaction
- (c) spermiogenesis
- (d) capacitation

. Question 12 Spermiation is the process of the release of sperms from

- (a) seminiferous
- (b) vas deferens
- (c) epididymis
- (d) prostate gland

Question 13. Mature Graafian follicle is generally present in the ovary of a healthy human female around

- (a) 5-8 day of menstrual cycle
- (b) 11-17 day of menstrual cycle
- (c) 18-23 day of menstrual cycle
- (d) 24-28 day of menstrual cycle.

Question 14. Acrosomal reaction of the sperm occurs due to

- (a) its contact with zona pellucida of the ova
- (b) reactions within the uterine environment of the female
- (c) reactions within the epididymal environment of the male
- (d) androgens produced in the uterus.

Question 15. Which one of the following is not a male accessory gland ?

- (a) Seminal vesicle
- (b) Ampulla

(c) Prostate

(d) Bulbourethral gland

Question 16. Which among the following has 23 chromosomes ?

(a) Spermatogonia

(b) Zygote

(c) Secondary oocyte

(d) Oogonia Question

17. Which of the following hormones is not secreted by human placenta ?

a) hCG

(b) Estrogens

(c) Progesterone

(d) LH Question

18. The vas deferens receives duct from the seminal vesicle and opens into urethra as

(a) epididymis

(b) ejaculatory duct

(c) efferent ductile

(d) ureter Question

19. Urethral meatus refers to the-

(a) urinogenital duct

(b) opening of vas deferens into urethra

(c) external opening of the urinogenital duct

(d) muscles surrounding the urinogenital duct.

.Question 20. Morula is a developmental stage

- (a) between the zygote and blastocyst
- (b) between the blastocyst and gastrula
- (c) after the implantation
- (d) between implantation and parturition.

Question 21. The membranous cover of the ovum at ovulation is

- (a) corona radiata
- (b) zona radiate
- (c) zona pellucida
- (d) chorion. Question

22. Identify the odd one from the following

- (a) Labia minora
- (b) Fimbriae
- (c) Infundibulum
- (d) Isthmus

Question 23. Temperature of the scrotum which is necessary for the functioning of testis is always around below body temperature.

- (a) 2°C
- (b) 4°C
- (c) 6°C
- (d) 8°C

Question 24. Which of the following is correct about mammalian testes?

- (a) Graafian follicles, Sertoli cells, Leydig's cells
- (b) Graafian follicles, Sertoli cells, Seminiferous tubules
- (c) Sertoli cells, Seminiferous tubules, Leydig's cells

(d) Graafian follicle, Leydig's cells, Seminiferous tubule

Question 25. The nutritive cells found in seminiferous tubules are

- (a) Leydig's cells
- (b) atretic follicular cells
- (c) Sertoli cells
- (d) chromaffin cells.

Question 26. Sertoli cells are regulated by the pituitary hormone known as

- (a) LH
- (b) FSH
- (c) GH
- (d) prolactin.

Question 27. The head of the epididymis at the head of the testis is called

- (a) cauda epididymis
- (b) vas deferens
- (c) caput epididymis
- (d) gubernaculum.

Question 28. Seminal plasma in humans is rich in (

- a) fructose and calcium but has no enzymes
- (b) glucose and certain enzymes but has no calcium
- (c) fructose and certain enzymes but poor in
- (d) fructose, calcium and certain enzymes.

Question 29. Prostate glands are located below

- (a) gubernaculum

(b) seminal vesicles

(c) epididymis

(d) bulbourethral glands

Question 30. The function of the secretion of prostate gland is to

(a) inhibit sperm activity

(b) attract sperms

(c) stimulate sperm activity

(d) none of these.

Question 31. Lower narrow end of uterus is called (a) urethra

(b) cervix

(c) clitoris

(d) vulva.

Question 32. Bartholin's glands are situated

(a) on the either side of vagina in humans

(b) on either side of vas deferens in humans

(c) on either side of penis in humans

(d) on either side of Fallopian tube in humans.

Question 33. In human adult females oxytocin

(a) stimulates pituitary to secrete vasopressin

(b) causes strong uterine contractions during parturition

(c) is secreted by anterior pituitary

(d) stimulates growth of mammary gland

Question 34. The third stage of parturition is called —after-birth—. In this stage

(a) excessive bleeding occurs

(b) fetus is born and cervix and vagina contraction to normal condition happens

(c) fetus is born and contraction of uterine wall prevents excessive bleeding

(d) placenta is expelled out.

Question 35. After birth, colostrum is released from mammary glands which is rich in

(a) fat and low in proteins

(b) proteins and low in fat

(c) proteins, antibodies and low in fat

(d) proteins, fat and low in antibodies.

Question 36. Spot the odd one out from the following structures with reference to the male reproductive system.

(a) Rate testis

(b) Epididymis

(c) Vasa efferentia

(d) Isthmus Question

37. Seminal plasma, the fluid part of semen, is contributed by

(i) seminal vesicle

(ii) prostate

(iii) urethra

(iv) bulbourethral gland

a) (i) and (ii)

(b) (i), (ii) and (iv)

(c) (ii), (iii) and (iv)

(d) (i) and (iv)

Question 38. In humans, at the end of the first meiotic division, the male germ cells differentiate into the

- (a) spermatids
- (b) spermatogonia
- (c) primary spermatocytes
- (d) secondary spermatocytes.

Question 39. How many sperms are formed from a secondary spermatocyte ?

- (a) 4
- (b) 8
- (c) 2
- (d) 1

Question 40. How many sperms are formed from 4 primary spermatocytes ?

- (a) 4
- (b) 1
- (c) 16
- (d) 32

Question 41. In spermatogenesis, reduction division of chromosome occurs during conversion of

- (a) spermatogonia to primary spermatocytes
- (b) primary spermatocytes to secondary spermatocytes
- (c) secondary spermatocytes to spermatids
- (d) spermatids to sperms.

Question 42. Which of the following groups of cells in the male gonad, represent haploid cells ?

- (a) Spermatogonial cells
- (b) Germinal epithelial cells
- (c) Secondary spermatocytes
- (d) Primary spermatocytes

Question 43. The process of release of spermatozoa from Sertoli cells into cavity of the seminiferous tubules is called

- (a) spermiogenesis
- (b) spermatogenesis
- (c) spermatocytogenesis
- (d) spermiation.

Question 44. The principal tail piece of human sperm shows the microtubular arrangement of

- (a) 7+ 2
- (b) 9+ 2
- (c) 11+2
- (d) 13 + 2

Question 45. Acrosome is a type of

- (a) lysosome
- (b) flagellum
- (c) ribosome
- (d) basal body.

Question 46. Which of the following contains the actual genetic part of a sperm ?

- (a) Whole of it
- (b) Tail
- (c) Middle piece

(d) Head Question

47. The sperms undergo physiological maturation, acquiring increased motility and fertilizing capacity in

- (a) seminiferous tubules
- (b) vasa efferentia
- (c) epididymis
- (d) vagina.

Question 48. At what stage of life is oogenesis initiated in a human female ?

- (a) At puberty
- (b) During menarche
- (c) During menopause
- (d) During embryonic development

Question 49. 1st polar body is formed at which stage of oogenesis?

- (a) 1st meiosis
- (b) 2nd mitosis
- (c) 1st mitosis
- (d) Differentiation

Question 50. Which one is released from the ovary ?

- (a) Primary oocyte
- (b) Secondary oocyte
- (c) Graafian follicle
- (d) Oogonium .

Question 51. During oogenesis, each diploid cell produces

- (a) four functional eggs

- (b) two functional eggs and two polar bodies
- (c) one functional egg and three polar bodies
- (d) four functional polar bodies.

Question 52. In oogenesis haploid egg is fertilised by sperm at which stage ?

- (a) Primary oocyte
- (b) Secondary oocyte
- (c) Oogonium
- (d) Ovum

53. Layers of an ovum from outside to inside is

- (a) corona radiata, zona pellucida and vitelline membrane
- (b) zona pellucida, corona radiata and vitelline membrane
- (c) vitelline membrane, zona pellucida and corona radiata
- (d) zona pellucida, vitelline membrane and corona radiata.

Question 54. Which part of ovary in mammals acts as an endocrine gland after ovulation ?

- (a) Stroma
- (b) Germinal epithelium
- (c) Vitelline membrane
- (d) Graafian follicle

Question 55. The sex of the fetus will be decided at

- (a) fertilisation by male gamete
- (b) implantation
- (c) fertilisation by female gamete
- (d) the start of cleavage.

Question 56. What is true about cleavage in the fertilised egg in humans ?

- (a) It starts while the egg is in Fallopian tube.
- (b) It starts when the egg reaches uterus.
- (c) It is meroblastic
- (d) It is identical to the normal mitosis.

Question 57. Cleavage differs from mitosis in lacking

- (a) synthetic phase
- (b) growth phase
- (c) both (a) and (b)
- (d) none of these.

Question 58. The solid mass of 8-16 cells formed from zygote after successive mitotic divisions is called

- (a) blastula
- (b) gastrula
- (c) morula
- (d) none of these.

Question 59. Implantation takes place afterof fertilisation.

- (a) 5 days
- (b) 6 days
- (c) 7 days
- (d) 8 days

Question 60. Structure connecting the fetus to placenta is

- (a) umbilical cord
- (b) amnion

- (c) yolk sac
- (d) chorion.

Question 61. Which of the following hormones is not a secretory product of human placenta?

- (a) Human chorionic gonadotropin
- (b) Prolactin
- (c) Estrogen
- (d) Progesterone

Question 62. Urine test during pregnancy determines the presence of

- (a) human chorionic gonadotropin hormone
- (b) estrogen
- (c) progesterone
- (d) luteinising hormone.

Question 63. In the event of pregnancy, the corpus luteum persists under the influence of

- (a) LH
- (b) FSH
- (c) chorionic gonadotropin
- (d) progesterone.

Question 64. During the development of embryo, which of the following occurs first?

- (a) Differentiation of organ
- (b) Differentiation of tissue
- (c) Differentiation of organ system
- (d) Differentiation of cells

Question 65. The structures derived from ectoderm are

(i) pituitary gland (ii) cornea (iii) kidneys (iv) notochord

(a) (i) and (iii)

(b) (ii) and (iii)

(c) (i) and (ii)

(d) (ii) and (iv).

Question 66. Gastrula is the embryonic stage in which

(a) cleavage occurs

(b) blastocoel form

(c) germinal layers form

(d) villi form. Question 67.

the development of the human body, the ectoderm is responsible for the formation of

(a) lens of the eye

(b) nervous system

(c) sweat glands

(d) all of these.

Question 68. The first movements of the foetus and appearance of hair on its head are usually observed during which month of pregnancy?

(a) Fourth month

(b) Fifth month

(c) Sixth month

(d) Third month

Question 69. The early stage human embryo distinctly possesses

(a) gills

(b) gill slits

(c) external ear (pinna)

(d) eyebrows.

Question 70. Delivery of developed fetus is scientifically called

(a) parturition

(b) oviposition

(c) abortion

(d) ovulation.

ANSWERS QUESTIONS ANSWERS QUESTIONS ANSWERS QUESTIONS ANSWERS

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

(Assertion Reason) Directions: 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.

1. 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°C for normal spermatogenesis.

2. Assertion: Testicular lobules are the compartments present in testes.

Reason: These lobules are involved in the process of fertilization

. 3. Assertion: Interstitial cell is present in the region outside the seminiferous tubule called interstitial spaces.

Reason: Interstitial cells provide nutrition to the sertoli cells.

4. Assertion: The testes are situated outside the abdominal cavity within the scrotum.

Reason: Muscles in scrotum helps to maintain low temperature of testes, necessary for spermatogenesis.

5. Assertion: The bulbourethral gland is a male accessory gland.

Reason: Its secretion helps in the lubrication of the penis, thereby facilitating reproduction.

6. Assertion: Each seminiferous tubule is lined on its inside by three type of cells.

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

7. Assertion: In human male, there are perianal glands near the anus.
Reason: Perianal glands secrete sex-attractant pheromone which initiates sexual desire in human.

8. Assertion: Testes are located in the scrotum, outside the coelom.
Reason: A vaginal coelom partly surrounds the testes in the scrotum.

9. Assertion: Fimbriae are finger-like projections of the infundibulum part of oviduct which is closest to ovary.

Reason: They are important for collection of ovum after ovulation from ovary.

10. Assertion: Finger-like projections appear on the trophoblast called chorionic villi after implantation.

Reason: Chorionic villi are surrounded by the uterine tissue and maternal blood.

11. Assertion: Infundibulum is a funnel shaped part closer to ovary.

Reason: The edges of infundibulum help in collection of the ovum after ovulation.

12. Assertion: The female external genitalia includes mons pubis, labia majora and labia minora.

Reason: The glandular tissue of each breast is divided into 5-10 mammary lobes.

13. Assertion: Vagina acts as copulation canal and fertilization canal.

Reason: Both insemination and fusion of gametes occur in the vagina of female.

14. Assertion: In the testis, spermatogenesis occurs in the seminiferous tubules and testosterone secretion takes place from the Sertoli cells.
Reason: Testosterone brings growth and maturation of primary sex organs and also development of accessory sex characters.

15. Assertion: Spermatogenesis starts at the age of puberty.

Reason: There is a significant increase in level of gonadotropin releasing hormone at puberty.

16. Assertion: Human male ejaculates about 200 to 300 million sperms during coitus

Reason: Only few reach the isthmus ampullary junction for process of fertilisation.

17. Assertion: The sperm head contains a cap-like structure called acrosome.

Reason: Acrosome is filled with enzymes that help in fertilisation of the ovum.

18. Assertion: A drop in temperature does not affect spermatogenesis.

Reason: During temperature drop, the smooth muscles contract and bring the testes closer to the pelvic cavity.

19. Assertion: The human male ejaculates about 50-100 million sperms during coitus.

Reason: For normal shape and size.

20. Assertion: The type B spermatogonia undergo mitosis to form primary spermatocyte.

Reason: Primary spermatocyte completes the first meiotic division leading to secondary spermatocytes.

21. Assertion: The middle piece is called as power house of the sperm.

Reason: The numerous mitochondria coiling around axial filament produce energy for the movement of the tail.

22. Assertion: The regions outside the seminiferous tubules are called interstitial spaces, which contain Leydig cell.

Reason: Leydig cells synthesise and secrete testicular hormones called androgens.

23. Assertion: Primary spermatocytes of testes are haploid

. Reason: These are formed by meiosis-I in the spermatogonia

. 24. Assertion: Stem cells possess the property of totipotency.

Reason: These cells can give rise to any type of cells.

25. Assertion: At puberty, human male develops secondary sexual characters.

Reason: At puberty, there is decreased secretion of testosterone in male.

26. Assertion: Head of sperm consists of acrosome and mitochondria.

Reason: Acrosome contains spiral row of mitochondria.

27. Assertion: In a Graafian follicle, the primary oocyte and the follicular cells may be regarded as sibling cells.

Reason: Both arise from the same parent cell the oogonium by mitotic division.

28. Assertion: The shape of the uterus is like an inverted pear

Reason: The inner glandular layer that lines the uterine cavity is called as myometrium.

29. Assertion: Fallopian funnel of oviduct has finger-like fimbriae.

Reason: Graafian follicle of ovary is with secondary oocyte hanging in cavity called antrum.

30. Assertion: Production of FSH increases, while that of LH decreases in the ovulation phase.

Reason: Due to decrease in the level of LH, ovulation (releasing of ova) takes place.

31. Assertion: Graafian follicle ruptures at the mid of menstrual cycle releasing the ovum.

Reason: Both LH and FSH attain a peak level at the middle of cycle.

32. Assertion: Progesterone is required for maintenance of the endometrium.

Reason: Endometrium is essential for implantation of embryo.

33. Assertion: The endometrium undergoes cyclical changes during menstrual cycle.

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

34. Assertion: Menstrual phase is also called shedding tears of lost ovum.

Reason: In the menstrual phase, cast of endometrial lining along with ovum takes place due to reduced titre of oestrogen and progesterone.

35. Assertion : Penetration of sperm into ovum is a chemical process.

Reason : Acrosome of sperm secretes a lytic enzyme hyaluronidase which dissolves vitelline membrane of ovum.

36. Assertion: Size of breasts increases at puberty in human female.

Reason: Prolactin secretion starts at puberty.

37. Assertion: During fertilization only head of spermatozoa enters egg.

Reason: If several spermatozoa hit the egg at same time, all can enter the egg.

38. Assertion: Corpus luteum degenerates in the absence of fertilization.

Reason: Progesterone level decreases.

39. Assertion: Mammalian ova produces hyaluronidase.

Reason: The eggs of mammal are microlecithal and telolecithal.

40. Assertion: Ovum retains most of the contents of the primary oocyte and is much larger than a spermatozoa.

Reason: Ovum requires energy to go about in search of a spermatozoa for fertilisation.

41. Assertion: Not all copulation leads to pregnancy.

Reason: Fertilisation can only occur if the ovum and sperms are transported simultaneously to the ampullary isthmic junction.

42. Assertion: Implantation is the process of attachment of blastocyst on uterine endometrium.

Reason: Implantation is controlled by trophoblast and occurs by decidual cell reaction.

43. Assertion: Placenta is an endocrine gland.

Reason: It secretes many hormones essential for pregnancy

. 44. Assertion: A woman passes out hCG in the urine during pregnancy

. Reason: The presence of hCG in urine is the basis for pregnancy test.

45. Assertion: Breast feeding during initial period of infant growth is recommended.

Reason: Colostrum contains several antibodies, essential to render immunity in newborns.

46. Assertion: During pregnancy, the levels of hormones like estrogens and progesterone are increased.

Reason: The increased production of these hormones is essential for foetal growth.

47. Assertion: Vigorous contraction of the uterus at the end of pregnancy causes expulsion.

Reason: The stimulatory reflex between the uterine contraction and oxytocin results in weakening contractions.

48. Assertion: There is generally monospermy in most of animals.

Reason: Vitelline membrane of ovum checks polyspermy

49. Assertion: All Metatherian are placental mammals. Reason: All placental mammals have menstrual cycle.

50. Assertion: Placenta in addition to connection with mother and foetus, is a ductless gland.

Reason: It releases human gonadotropins.

51. Assertion: Embryonic development proves inter-relationship and common ancestry of metazoans.

Reason: It involves similar sequence of five dynamic processes during development

52. Assertion: In morula stage, cells divide without increase in size.

Reason : Zona pellucida remains undivided till cleavage is complete.

53. Assertion: The embryo with 8 to 16 blastomeres is called a morula.

Reason: The morula continues to divide and transforms into trophoblast.

54. Assertion: Parturition is induced by neural signal in maternal pituitary.

Reason: At the end of gestation period, the maternal pituitary releases prolactin which causes uterine contractions.

SOLUTION

1. (a) In human male, one pair testes are present in thin walled skin pouches called scrotal sac (so are extra abdominal) hanging from lower abdominal wall between the legs. Scrotal sac act as thermoregulators and keeps the testicular temperature 2°C lower than body temperature for normal spermatogenesis, as high abdominal temperature kills the spermatogenic tissue.

2. (d) Testicular lobules are the compartments present in the testes that are not involved in the process of fertilization as whole. Fusion of male and female gametes is called fertilization.

3. (c) Leydig cells, also known as interstitial cells, are found adjacent to the seminiferous tubules in the testicle. They produce testosterone in the presence of luteinizing hormone (LH).

4. (a) The testes are situated outside the abdominal cavity within a pouch called scrotum. The scrotum helps in maintaining low temperature of the testes ($2-2.5^{\circ}\text{C}$) lower than the normal internal body temperature which is necessary for spermatogenesis.

5. (a) Bulbourethral gland, also called Cowper's Gland, either of two pea-shaped glands in the male are located beneath the prostate gland at the beginning of the internal portion of the penis. These are responsible for adding fluids to semen during the process of ejaculation, thereby facilitating the process of reproduction.

6. (d) Each seminiferous tubule is lined on its inside by two types of cells called male germ cells (spermatogonia) and sertoli cells. The male germ cells undergo meiotic divisions finally leading to sperm formation, while sertoli cells provide nutrition to the germ cells. The regions outside the seminiferous tubules called interstitial spaces, contain small blood vessels and interstitial cells or Leydig cells. Leydig cells synthesise and secrete testicular hormones called androgens.

7. (d) Perianal gland are found in rabbit not in human beings. These are a pair of dark elongated scent glands lying behind the cowper's glands. These are sex attractant secreting glands, its smell serves as sex attractant for the female.

8. (c) Vaginal coelom partly surrounds the testes in scrotum in a wrong statement because vagina is the part of external genitalia (vulva) in the female reproductive system and scrotum is a sac like structure in which testes are suspended.

9. (b) The ends of the fallopian tubes close to the ovaries are covered with finger like projections called fimbriae. Each of these fimbriae are covered with tiny hair like projections called cilia. When an egg cell is released from the ovary, it is swept into the fallopian tube by the cilia of the fimbriae.

10. (b) After implantation, finger-like projections appear on the trophoblast called chorionic villi which are surrounded by the uterine tissue and maternal blood. The chorionic villi and uterine tissue become interdigitated with each other and jointly form a structural and functional unit between developing embryo (foetus) and maternal body called placenta.

11. (b) In human females, each fallopian tube extends from the periphery of each ovary to the uterus, the part closer to the ovary is the funnel shaped infundibulum. The edges of the infundibulum possess finger-like projections called fimbriae which help in collection of the ovum after ovulation.

12. (c) The female external genitalia include mons pubis, labia majora, labia minora, hymen and clitoris. Mons pubis is a cushion of fatty tissue covered by skin and pubic hair. The labia majora are fleshy patches of tissue, which extend down the mons pubis and surrounds the vaginal opening. The labia minora are paired folds of tissue under the labia majora. A functional mammary gland is characteristic of all female mammals. The mammary glands are paired structures (breasts) that contain glandular tissue and variable amount of fat. The glandular tissue of each breast is divided into 15-20 mammary lobes containing clusters of cells called alveoli.

13. (d) Vagina is the tubular female copulatory organ. Passageway for menstrual flow as well as birth canal. Vagina receives semen from male during mating but fertilization (fusion of gametes) occurs in fallopian tube.

14. (d) In the testis, spermatogenesis occurs in the seminiferous tubules and testosterone secretion takes place in the interstitial cells. Testosterone brings growth and maturation of secondary sex organs. It also brings about development of secondary sex characters.

15. (a) Spermatogenesis starts at the age of puberty due to significant increase in the Gonadotropin Releasing Hormone (GnRH).

16. (a) The male releases large number of sperms inside female reproductive tract to increase chances of fertilisation.

17. (b) Acrosome contains enzymes that help the sperm penetrate the ova during the fertilisation process.

18. (a) The normal temperature of the testes in the scrotum is about 2-2.5 °C lower than the internal body temperature. When the body is chilled, the smooth muscle contracts and brings the testes closer to the

pelvic cavity. This movement towards the pelvic cavity allows the testes to absorb heat from the rest of the body so that the sperm cells do not become chilled and get optimum temperature for spermatogenesis.

19. (d) The human male ejaculates about 200 to 300 million sperms during a coitus out of which, at least 60 percent sperms must have normal shape and size and at least 40 percent of them must show vigorous motility for normal fertility.

20. (b) Type B spermatogonia undergo mitosis to produce diploid intermediate cells called primary spermatocytes. These cells further undergo first meiotic or reductional division to give rise to haploid secondary spermatocytes.

21. (a) The middle piece of human contains mitochondria coiled round the axial filament called mitochondrial spiral. They provide energy for the movement of the sperm. So it is called as the 'power house of the sperm'.

22. (b) Each testicular lobule contains one to three highly coiled seminiferous tubules in which sperms are produced. Each seminiferous tubule is lined on its inside by two types of cells called male germ cells (spermatogonia) and Sertoli cells. The male germ cells undergo meiotic divisions finally leading to sperm formation, while Sertoli cells provide nutrition to the germ cells. The regions outside the seminiferous tubules called interstitial spaces, contain small blood vessels and interstitial cells or Leydig cells. These cells synthesise and secrete testicular hormones called androgens.

23. (d) Primary spermatocytes of testes are diploid and formed by mitotic division in the spermatogonium.

24. (a) Stem cells have the property to give rise to any type of cell/tissue.

25. (c) Puberty in human male is controlled by male sex hormone testosterone which is secreted by interstitial or Leydig cells of testes.

So, secondary sexual characters develop and at puberty, secretion of testosterone is increased.

26. (c) Head of a sperm has acrosome but the spiral row of mitochondria are present in the mid (connecting) piece of the sperm.

27. (a) Primary oocyte and follicle cells both arise from the Graafian follicle by mitosis cell division. Hence, these are regarded as the sibling cells.

28. (c) The uterus is single and it is also called womb. The shape of the uterus is like an inverted pear. The wall of the uterus has three layers, external thin membranous perimetrium, middle thick layer of smooth myometrium and inner glandular layer of endometrium.

29. (b) Infundibulum is funnel shaped end of fallopian or oviduct. The funnel is called oviducal funnel or fallopian funnel. Its free end bears a number of finger like processes called fimbriae, but graafian follicle of ovary is with secondary oocyte hanging in cavity, called antrum.

30. (c) In fertility phase/ovulation, production of FSH decrease, while that of LH increases. It causes ovulation. The ovum is drawn into fallopian tube. It is viable for two days when fertilisation can occur. Ovulation takes place between 10th-14th day. Two characteristics of the fertility phase that help in fertilisation are : (i) Uterine movement help in the spread of sperms in female reproductive tract. (ii) Ciliary movements in the epithelium of fallopian tubes for bringing in the ovum. 20 |

31. (a) Graafian follicle is formed due to increase in FSH and ruptures due to rise in level of LH during middle of menstrual cycle.

32. (b) Progesterone prepares the uterus for pregnancy. After ovulation occurs, the ovaries start to produce progesterone needed by the uterus. Progesterone causes the uterine lining or endometrium to thicken. This helps to prepare a supportive environment in the uterus for a fertilized egg.

33. (b) The wall of the uterus has three layers of tissue. The external thin membranous perimetrium, middle thick layer of smooth muscle, myometrium and inner glandular layer called endometrium that lines the uterine cavity. The endometrium undergoes cyclical changes during menstrual cycle while the myometrium exhibits strong contraction during the delivery of the baby.

34. (a) Menstrual phase is the phase of menstrual flow which continues for 3-5 days and involves discharge of blood along with casting off endometrial lining due to reduced titre of both estrogen and progesterone. Menstrual phase is also called funeral of unfertilized egg or shedding tears of lost ovum. First day of menstrual phase is also considered to be first day of menstrual cycle.

35. (a) Penetration of sperm is a chemical mechanism. In this, acrosome of sperm undergoes acrosomal reaction and releases certain sperm lysins, which dissolve the egg locally and make the path for the penetration of sperm lysins which are acidic proteins. These sperm lysins contain a lysing enzyme hyaluronidase which dissolves the hyaluronic acid polymers in the intercellular spaces which holds the granulosa cells of corona radiata together; corona penetrating enzyme and acrosin. Then it dissolves the zona pellucida. Only sperm nucleus and middle piece enters the ovum.

36. (b) In female, breasts size increases after puberty under the stimulation of estrogen. Size of breasts is further increased during pregnancy and after childbirth under the stimulation of prolactin hormone.

37. (c) During fertilization, only one sperm head enters into ovum and remaining parts of body degenerates. If several spermatozoa hit the egg at same time, even then only one can get entry into egg because after entry of one sperm, the egg becomes impervious to other sperms.

38. (b) In female, graafian follicle forms corpus luteum after ovulation. The cells of corpus luteum are called luteal cells. The cytoplasm of luteal cells have yellow granules called lutein which secrete the hormone progesterone to maintain pregnancy if

fertilization takes place. In the absence of fertilization, corpus luteum degenerates and forms corpus albicans and there is decrease in progesterone level as well.

39. (d) Hyaluronidase, a hydrolytic enzyme is an acrosomal content in mammalian sperm. It helps at the time of fertilization during the penetration of the sperm into the ovum. Based on the amount of yolk, mammalian eggs are alecithal means egg without yolk. Microlecithal eggs contain very little yolk e.g., sea urchin, starfish. On the basis of distribution of yolk telolecithal eggs are those eggs in which the yolk, is concentrated towards the vegetal pole and cytoplasm and nucleus lie near the animal pole, e.g., birds and reptiles.

40. (c) Sperm needs energy to move about in female tract, so that fertilisation of ova takes place.

41. (a) All copulation do not lead to fertilisation as the synchronisation of sperm and ova reaching the fallopian tube is important.

42. (b) The process of attachment of the blastocyst (mammalian blastula) on the endometrium of uterus is called implantation.

43. (b) Placenta is an endocrine gland that is present only during pregnancy. It is responsible for production of various hormones like human Chorionic Gonadotropin (hCG), estrogen, progesterone, human placental lactogen (hPL).

44. (b) The chorionic cells secrete a hormone called human Chorionic Gonadotropin (hCG), which resembles and takes over the job of pituitary LH during pregnancy. hCG maintains the corpus luteum and stimulates it to secrete progesterone.

45. (a) Colostrum is rich in antibodies, which is essential for new born babies.

46. (b) During pregnancy, the levels of hormones like estrogen, progestrogens, cortisol, prolactin, thyroxine, etc., are increased several folds in the maternal blood. Increased production of these

hormones is essential for supporting the foetal growth, metabolic changes in the mother and maintenance of pregnancy.

47. (c) Vigorous contraction of the uterus at the end of pregnancy causes parturition. Parturition is induced by a complex neuroendocrine mechanism. The signals for parturition originate from the fully developed foetus and the placenta which induce mild uterine contractions called foetal ejection reflex.

48. (b) Entrance of a single sperm into an oocyte is called monospermy generally found in most of animals. Cortical granules are extruded in the perivitelline space by exocytosis and some of these are attached along inner surface of vitelline membrane which now thickens and becomes impervious to any other sperm entry. It is now called fertilization membrane. It prevents polyspermy.

49. (b) Metatherians are pouched mammals or marsupials, whereas eutherians are placental mammals with well developed placenta

50. (a) Placenta is a ductless endocrine gland which produces various hormones like human Chorionic Gonadotropin (hCG), estrogen, progesterone, human placental lactogen (hPL).

51. (a) Embryonic development includes a definite series of phases which are fundamentally similar in all sexually reproducing organisms, and transform a one-celled zygote to a multicellular and fully formed developmental stage till hatching or birth. Such a remarkable similarity of embryonic development proves that all metazoans are interrelated and have common ancestry. Embryonic development involves five dynamic changes and identifiable processes which are - gametogenesis, fertilization, cleavage, gastrulation and organogenesis.

52. (a) Morula involves cleavage of cells till 32 cell stage is formed. It is still surrounded by zona pellucida.

53. (c) Cleavage starts as the zygote moves through the isthmus of the oviduct towards the uterus and forms 2, 4, 8, 16 daughter cells called blastomeres. The embryo with 8 to 16 blastomeres is called a

morula. The morula continues to divide and transforms into blastocyst as it moves further into the uterus.

54. (d) The process of delivery of foetus (childbirth) is called parturition. Parturition is induced by a complex neuroendocrine mechanism. The signals for parturition originate from the fully developed foetus and the placenta which induces mild uterine contractions called foetal ejection reflex. This triggers release of oxytocin from the maternal pituitary. Oxytocin acts on the uterine muscles and causes stronger uterine contractions which in turn stimulate further secretion of oxytocin. The stimulatory reflex between the uterine contractions and oxytocin secretion continues resulting in stronger and stronger contractions. This leads to expulsion of the baby out of the uterus through the birth canal.

CASE STUDY BASED QUESTION

The average duration of human pregnancy is about 9 months which is called the gestation period. Vigorous contraction of the uterus at the end of pregnancy causes expulsion / delivery of the foetus. This process of delivery of the foetus (childbirth) is called parturition. Parturition is induced by a complex neuroendocrine mechanism. The signals for parturition originate from the fully developed foetus and the placenta which induce mild uterine contractions called foetal ejection reflex. This triggers the release of oxytocin hormone from the maternal pituitary gland. Oxytocin acts on the uterine muscle and causes stronger uterine contractions, which in turn stimulates further secretion of oxytocin. The stimulatory reflex between the uterine contraction and oxytocin secretion continues resulting in stronger and stronger contractions. This leads to expulsion of the baby out of the uterus through the birth canal – parturition. Soon after the infant is delivered, the placenta is also expelled out of the uterus

. i. The birth of a baby is known as

a. Micturition

b. Parturition

c. Child

d. Oxytocin

ii. When a fully developed baby is not naturally delivered by the mother, it could be due to the –

a. Non-secretion of Oxytocin

b. Excess secretion of Oxytocin

c. Wide birth canal

d. None of the above.

iii. Soon after the infant is delivered, the placenta is also expelled out of the uterus, because

a. The infant requires the placenta to be alive

b. After the birth, there is no role for the placenta

c. Placenta is a part of the infant

d. None of the above

iv. Oxytocin is known as the child birth hormone as well as the:

a. Urine regulating hormone

b. Milk ejection hormone

c. Milk producing hormone

d. None of the above

v. Assertion: Release of oxytocin is essential for the child birth after the complete development of the foetus.

Reason: Premature release of Oxytocin leads to the birth of a premature baby.

Answers: 7 .i. b. ii. a. iii. b. iv. b. v. b.

CHAPTER-4: REPRODUCTIVE HEALTH

Question 1. Test-tube baby is a technique where:

- (a) Zygote is taken from the oviduct cultured and then implanted
- (b) Ovum is taken out, then fertilized and implanted
- (c) Sperms and ovum are fused and zygote grown in a test tube)
- (d) All the above

Question 2. It is a disease which affects the mucus membrane of urogenital tract in male and yellow discharge in urine with feeling of illness.

- (a) Warts
- (b) Syphilis
- (c) Gonorrhoea
- (d) AIDS

Question 3. Medical Termination of Pregnancy (MTP) is considered safe up to how many weeks of pregnancy?

- (a) Six weeks
- (b) Eight weeks
- (c) Twelve weeks
- (d) Eighteen weeks

Question 4. The human population follows

- (a) S-shaped growth curve
- (b) J-shaped growth curve
- (c) Z-shaped growth curve
- (d) All of the above

Question 5. Cu ions released from copper - releasing Intra Uterine Devices (IUDs):

- (a) make uterus unsuitable for implantation
- (b) increase phagocytosis of sperms
- (c) suppress sperm motility
- (d) prevent ovulation

Question 6. Acquired Immuno Deficiency Syndrome is _____.

- (a) An autoimmune disease
- (b) Reduction in number of Killer-T cells
- (c) Reduction in number of Helper-T cells

(d) Result of inability of the body to produce

Question 7. One of the legal methods of birth control is

(a) by abstaining from coitus from day 10-17 of the menstrual cycle.

(b) By premature ejaculation during coitus

(c) By having coitus at the time of daybreak

(d) Abortion by taking an appropriate medicine

Question 8. The period between entry of pathogen into the body and appearance of first symptom is called?

(a) Proliferative period (b) Growth period (c) Incubation period (d) Generative period

Question 9. 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.

Question 10. Choose the right one among the statements given below:

(a) IUDs are generally inserted by the user herself

(b) IUDs increase phagocytosis reaction in the uterus

(c) IUDs suppress gametogenesis

(d) IUDs once inserted need not be replaced.

Answer key

Answer 1: (b) Ovum is taken out, then fertilized and implanted

Answer 2: (c) Gonorrhoea

Answer 3: (c) Twelve weeks

Answer 4: (b) J-shaped growth curve

Answer 5: (c) suppress sperm motility

Answer 6: (c) Reduction in number of Helper-T cells

Answer 7: (a) by abstaining from coitus from day 10-17 of the menstrual cycle.

Answer 8: (c) Incubation period

Answer 9: (a) 72 hrs of coitus.

Answer 10: (b) IUDs increase phagocytosis reaction in the uterus

B. Assertion-Reason type questions.

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.

1. Assertion: Amniocentesis is often misemployed.

Reason: Amniocentesis is meant for determining the genetic disorders in the foetus, but it is being used to determine the sex of the foetus, leading to death of the normal female foetus.

Answer (a) :- Explanation

Amniocentesis (amniotic fluid test or AFT) is a medical procedure used in prenatal diagnosis of chromosomal abnormalities and fetal infections, and also for sex determination, in which a small amount of amniotic fluid, which contains foetal tissues, is sampled from the amniotic sac surrounding a developing foetus, and then the foetal DNA is examined for genetic abnormalities.

2. Assertion: A wide range of contraceptive methods are available for family planning.

Reason: Natural method includes condoms, diaphragms, etc., while barrier methods use of included method like periodic abstinence, lactational amenorrhea, etc.

Answer(c) :- Explanation

Natural methods work on the principle of avoiding chances of meeting of ovum and sperm, e.g. periodic abstinence, lactational amenorrhea. In barrier methods, ovum and sperm are prevented from physically meeting with help of a barrier, e.g. condoms, cervical caps, etc.

3. Assertion: Rapid decline in death rate, MMR and IMR have lead to a staggering rise in population.

Reason: Such an alarming growth rate has lead to an absolute scarcity of even the most basic requirements, i.e. food and shelter.

Answer (b):- Explanation

There is rapid decline in Infant Mortality Rate (IMR) and Maternal Mortality Rate (MMR) The recent World Bank data puts the MMR for India reported in 2015 at 174 per 100, 000 live births, which is a significant decline from the 215 figure that was reported in 2010.

4. Assertion: Reusable contraceptives are not full proof method of contraceptions.

Reason: Diaphragms, cervical caps and vaults are barrier methods which prevent conceptions by blocking entry of sperms through cervix. They are reusable.

Answer(b) :- Explanation

Reusable contraceptives do not guarantee prevention from accidental pregnancy.

5. Assertion: Periodic abstinence is a method in which couples avoid from coitus from day 17 to 27 of menstrual cycle.

Reason: It is a very effective method and 100% sure of birth control.

Answer(d) :- Explanation

Periodic abstinence is a natural method in which the couples avoid or abstain from coitus from day 10 to 17 of the menstrual cycle when ovulation could be expected. The effectiveness of this method is limited because only a few women have regular menstrual cycles and the actual time of ovulation can be produced as the ovulation in humans occurs about 14 days before the onset of the next menstruation.

C. CASE STUDY Type.

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

A 23 year old Sameer has been diagnosed with an infection of reproductive tract caused by bacteria. He complains about burning sensation during urination, pus-containing discharge and pain around genitalia. This infection has incubation period of 2-5 days but can be cured.

(i) From which disease is Sahil suffering

- (a) Chlamydiasis (b) Herpes (c) Gonorrhoea (d) Syphilis

(ii) Which among the following reproductive tract infections is transmitted by bacteria?

- (a) Trichomoniasis (b) Chancroid (c) Genital warts (d) Both (a) and (b)

(iii) Which mode of treatment would be useful for Sameer

- (a) Cryosurgery (b) Use of Podophyllum preparation
(c) Use of antibiotic ampicillin (d) It cannot be treated.

(iv) What technique was used to diagnose Sameer's disease?

- (a) Gram staining of discharge and culture (b) ELISA Test
(c) Antibody detection (d) Antigen test

(v) Find the odd one out.

- (a) Treponema pallidum (b) Neisseria gonorrhoea
(c) Haemophilus ducreyi (d) Trichomonas vaginalis

2. Read the following and answer any four questions from 2(i) to 2(v) given below:

Intrauterine devices are most widely accepted methods of contraception. These are used by females and are inserted by doctor or nurses in the uterus through vagina. However these devices are not recommended for those who eventually intend to conceive.

(i) How does CuT prevent conception?

- (a) Cu ions make uterus unsuitable for implantation.
(b) Cu ions make cervix hostile to the sperms.
(c) Cu ions suppress sperms motility.
(d) Cu ions inhibit ovulation.

(ii) Which of the following IUDS makes uterus unsuitable for implantation?

(a) LNG-20 (b) Multiload 375 (c) Cu7 (d) Lippes looploop

(iii) 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) They block entry of sperms through the cervix.

(d) Both (b) and (c)

(iv) 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

(v) Assertion : IUDS can cause excess menstrual bleeding and pain.

Reason : IUDS can perforate 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.

Answers- 1. (i) (c) : Sameer is suffering from gonorrhoea, a sexually transmitted disease caused by an bacterium *Neisseria gonorrhoea*.

(ii) (b) : Trichomoniasis, chancroid and genital warts are STDS caused by protozoa, bacteria and virus respectively.

(iii) (c) : Gonorrhoea can be cured through use of appropriate antibiotics like penicillin and ampicillin.

(iv) (a)

(v) (d) : *Treponema pallidum*, *Neisseria gonorrhoeae* and *Haemophilus ducreyi* are bacterial organisms which cause syphilis, gonorrhoea and chancroid respectively. *Trichomonas vaginalis* is an protozoan which causes trichomoniasis.

2. (i) (c) : Cu Ions suppress motility and fertilising capacity of sperms.

(ii) (a) : Hormone releasing IUDS (progestasert, LNG-20) make the uterus unsuitable for implantation and the cervix hostile to the sperms.

(iii) (b)

(iv) (a) : Lippes loop is a non-medicated IUD and progestasert is a hormone releasing IUD.

(v) (b)

These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses.

A) Both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B) Both Assertion and Reason are true but the Reason is not a correct explanation of the Assertion.

C) Assertion is true but the Reason is false.

D) Both Assertion and Reason are false

1. Assertion: Use of condom is a safeguard against AIDS and sexual diseases besides checking pregnancy.

Reason: Condoms are physical barriers preventing body fluid of two partners to come in contact.

2. Assertion: Copper-T is an effective IUD commonly used by urban Indian women.

Reason: Copper –T stops the transport of sperms till the ampullary isthmic junction.

3. Assertion: CDRI Lucknow has developed Mala-D which is non steroidal, once a week pill.

Reason: Hormonal contraceptives help to balance the hormonal level in body for proper functioning of gonads.

4. Assertion: ARTs are available for childless couples to have a baby but all cannot afford.

Reason: These are very specialized, costly techniques performed by specialists and these facilities are available in some cities only

. 5. Assertion: Copper –T is effective contraceptive used by women.

Reason- Copper ions reduce the motility and fertilizing capacity of

sperms, increase phagocytosis of sperms inside the uterus, hence prevent conception.

ANSWERS

1. A) Both Assertion and Reason are true and the Reason is correct explanation of the Assertion.
2. C) Assertion is true but the Reason is false.
3. D) Both Assertion and Reason are false
4. A) Both Assertion and Reason are true and the Reason is correct explanation of the Assertion.
5. B) Both Assertion and Reason are true and the Reason is not the correct explanation of the Assertion.

CASE BASED QUESTIONS

REPRODUCTIVE AND CHILD HEALTH CARE PROGRAMME

India was the first country in the world to adopt an official population policy and launch official family planning programme way back in 1952 which remains the mainstay of family planning efforts. During its early years, the programme focused on the health rationale of family planning. Family planning as a strategy for population stabilization received attention only after 1971 population census. This strategy resulted in an increase in the proportion of couples effectively protected from 12.4 percent during 1971- 72 to 46.5percent during 1995- 96 but remained stagnant during 1995-96 through 2003-04 and decreased to 40.4 during 2010-11. After the launch of the National Rural Health Mission in 2005, the official family planning programme has been subsumed in the reproductive and child health component of the Mission. However, universal adoption of small family norm still remains a distant dream in India. During 2007-08, only about 54percent of the currently married women aged 15–49 years or their husbands were using a contraceptive method to regulate their fertility and the contraceptive prevalence rate appears to have

stagnated after 2004. Moreover, contraceptive practice in India is known to be very heavily skewed towards terminal methods which mean that contraception in India is practiced primarily for birth limitation rather than birth planning.

Reproductive and Child Health Care programme is a comprehensive sector wide flagship programme, under the umbrella of the Government of India's (GoI) National Health Mission (NHM), to deliver the RCH targets for reduction of maternal and infant mortality and total fertility rates.

Components of RCH Programme: Women's health, safe motherhood (including safe management of unwanted pregnancy and abortion women's development. Child health (child survival and child development). Adolescent Health (sexuality development, adolescence education and vocational component)

1.1 What is the full form of RCH?

- A) Reproductive and Child Health Care
- B) Reproductive and Child Health programme
- C) Reproductive and Child Health Care programme
- D) Reproductive and Child Health

1.2 Mention which of the following is not a major task under RCH programmes?

- A) Creating awareness about reproduction related aspects.
- B) Providing facilities and support for building reproductively healthy society.
- C) Sex determination of the unborn.
- D) All the above.

1.3 RCH also aims to create awareness about problems due to uncontrolled population growth because –

- A) It increases cases related to sexual abuse and sex related crimes.
- B) It increases various social evils like poverty, unemployment.
- C) It increases the rate of basic requirements like food, shelter and clothing.
- D) All the above

1.4 According to 2001 census report, the population growth was s till around _____ percent at which our population could double in _____ years.

- A) 17, 33
- B) 18, 33
- C) 17, 35
- D) None of the above

1.5 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.

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

Answers- 1.1-D, 1.2-C, 1.3-D, 1.4-A, 1.5-A)

2. CONTRACEPTIVES

Contraception is defined as the intentional prevention of conception through the use of various device es, sexual practices, chemicals,

drugs, or surgical procedures. Thus, any device or act whose purpose is to prevent a woman from becoming pregnant can be considered as a contraceptive.

The different types of contraception-

• Cap. • Combined pill. • Condoms. • Contraceptive implant. • Contraceptive injection. • Contraceptive patch. • Diaphragm. • Female condoms.

• In India, over 139 million women and girls now use a modern method of contraception, it further said. The report said 320 million women and girls in the world's 69 lowest -income countries now have access to family planning, according to new figures released by Family Planning 2020 (FP2020).

2.1 What are the different reasons due to which contraceptive are used?

A) To keep space between the children.

B) To delay or avoid pregnancy/ pregnancy related complications.

C) To avoid other problems like painful menstruations, skin problems, PCOD, etc.

D) All the above.

2.2 Which of the following is not a characteristic feature of an ideal contraceptive?

A) It should be cheap and easily available

B) It should interfere with sexual drive of user.

C) It should be effective with least side effects.

D) All the above.

2.3 Government through RCH has promoted small families to overcome the problems associated with population explosion in our country through various means.

Which of the following options is not an effort by the Government and RCH?

- A) Statutory raising the marriageable age of female to 18 years and that of males to 21 years.

B) Media showing happy couple with many children.

C) Popularising slogans like HUM DO HUMARE DO and urban working couples are adopting one child norm.

D) Incentives given by government to people with small families.

2.4 Which of the following is not used as a contraceptive by females?

A) Tubectomy

B) Female Condoms

C) Implants

D) Cervical caps

2.5 Assertion: Amniocentesis is often misused detect the sex of the unborn baby.

Reason: Amniocentesis is meant for determining the chromosomal/genetic disorders in the fetus, but is being used to determine the sex of the fetus so that female fetus may be aborted.

A. Both Assertion and Reason are true and the Reason is correct explanation of the Assertion

B. . B. Both Assertion and Reason are true but the Reason is not a correct explanation of the Assertion.

C. C. Assertion is true but the Reason is false.

D. D. Both Assertion and Reason are false. ■

ANSWERS- 2.1-D, 2.2-B, 2.3- B, 2.4-A, 2.5-A)

3. CONTRACEPTIVES

A wide range of contraceptives are available today to avoid pregnancy. The major categories of contraceptives include natural/

traditional, barrier, IUDs, oral contraceptives, injectable, implants and surgical methods. The natural / traditional method includes periodic abstinence, withdrawal or coitus interruptus, lactational amenorrhoea. Barrier methods (usage of condoms, diaphragms, cervical caps and vaults), IUDs (Intra Uterine Devices), pills (oral contraceptives) and sterilization by surgical methods (tubectomy and vasectomy) all are included in the artificial methods of contraception. IUDs and pills are the hormonal methods of contraception.

3.1 Which according to your knowledge of menstrual cycle are safe days for unprotected sex without having fear of conception?

A) Between day 1 to day 10 of menstrual cycle and then between day 20-day 30 of menstrual cycle.

B) Between day 1 to day 9 of menstrual cycle and then between day 18 - day 30 of menstrual cycle.

C) Between day 1 to day 12 of menstrual cycle and then between day 20- day 30 of menstrual cycle.

D) None of the above.

3.2 In some females just after the child birth, during the breast-feeding phase, there is a phase of the absence of menstruation. This fully prevents conception.

A) True

B) False

C) Not sure

3.3 Which is not the characteristic feature of Natural methods of contraception?

A) Very effective

B) No chances of failure when used.

C) None of the above

D) Both A and B

3.4 Which of the following is not a characteristic feature of Diaphragms, cervical caps and vaults?

A) These are used by females

B) These are reusable

C) These block the entry of sperms through the cervix

D) These are effective only when used with spermicidal creams, jellies and foams

3.5 Assertion: IUDs are an ideal and most widely used contraceptive for the females in India.

Reason: It gives freedom to males to take decision about delaying of pregnancy and/or space children for a period of 3-5 years.

A) Both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B) Both Assertion and Reason are true but the Reason is not a correct explanation of the Assertion.

C) Assertion is true but the Reason is false.

D) Both Assertion and Reason are false.

ANSWERS- 3.1-B, 3.2- A, 3.3-D, 3.4-D, 3.5- C)

4. MEDICAL TERMINATION OF PREGNANCY (MTP)

Intentional or voluntary termination of pregnancy is called medical termination of pregnancy. Medical termination of pregnancy is also termed as induced abortion. MTPs are used to get rid of unwanted pregnancies and the pregnancies which could be harmful or fatal to the mother or to the foetus or both. MTPs are safe up to 12 weeks i.e. the first trimester of pregnancy. Government of India legalized MTP. Nearly 45 to 50 million MTPs are performed in a year all

over the world which accounts to 1/5th of the total number of conceived pregnancies in a year. Every day 13 women die in India due to unsafe abortion-related causes. Nearly 6.4 million pregnancies are terminated every year in India. Unsafe abortion, the third leading cause of maternal deaths in the country, contributes eight per cent of all such deaths annually.

4.1 Under which conditions it is not legal to perform MTP upto 12 weeks of pregnancy?

A) When the continuation of pregnancy is dangerous for the life of mother.

B) When continuation of pregnancy is dangerous for the life of father.

C) In case of pregnancy due to rape.

D) In case of chromosomal / genetic defect in foetus.

4.2 If MTP is performed after it is detected that the sex of the foetus is female, then it is known as

A) Female foeticide

B) Amniocentesis

C) Threatened abortion

D) None of the above

4.3 MTP can imbalance

A) Population in a country

B) Sex ratio

C) Birth rate

D) IMR

4.4 In which year Government of India legalized MTP?

A) 1975

B) 1991

C) 1971

D) 1981

4.5 Assertion: MTP is not to be performed after first trimester.

Reason: In second trimester, the maternal and foetal tissues are intricately inter digited that MTP can lead to excessive blood loss and death of mother.

A) Both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B) Both Assertion and Reason are true but the Reason is not a correct explanation of the Assertion.

C) Assertion is true but the Reason is false.

D) Both Assertion and Reason are false.

ANSWERS-4.1-B, 4.2-B, 4.3-B, 4.4- C, 4.5- A) 5.

SEXUALLY TRANSMITTED DISEASES-

STDs constitute a major public health problem for both developing and developed countries. The emergence of HIV infection has increased the importance of measures aimed at control of STDs. A proper understanding of the patterns of STDs prevailing in different geographic regions of a country is necessary for proper planning and implementation of STD control strategies. It is with this aim that the authors have reviewed the relevant published literature from India over the past 25 years. To sum up, bacterial STDs like chancroid and gonorrhoea are showing a declining trend, but the viral STDs like herpes genitalis and condylomata acuminata are showing upward trend. There is a decline in the number of

patients with STDs attending the hospital. Whether this is due to an actual decrease in the incidence of STDs or due to other factors is uncertain. The increased availability of facilities for treatment of STDs at peripheral centers might be a factor leading to a decline in the number of patients with STDs approaching higher centers like the teaching hospital where this study was undertaken. The emphasis on the syndromic approach to the management of STDs might have increased the accessibility to healthcare for these patients with STDs. Awareness about HIV and fear of contracting the STDs are likely to have influenced the risk-taking behavior of people, thereby reducing the likelihood of being infected with STDs. Another factor to be considered is the widespread use of anti bacterial, including quinolones and the new macrolides, for the treatment of other diseases. This can result in partial treatment or modified course of the bacterial STDs, thereby leading to apparent reduction in the total number of cases of STDs attending STD clinics as well as a decrease in the proportion of bacterial to viral STDs.

5.1 Which of the following is not a bacterial STD?

- A) Syphilis
- B) Gonorrhoea
- C) Herpes genitalis
- D) Chlamydia

5.2 Choose the odd one out

- A) Genital herpes
- B) Genital warts
- C) Trichomoniasis
- D) Hepatitis B

5.3 Which of the following symptoms is not seen in case of an STD?

- A) Slight pain in genitals
- B) Swelling in the genitals
- C) Itching and fluid discharge from the genitals
- D) Redness/discoloration in the genitals

5.4 Which of the following is not a complication which arises when STDs are not treated on time?

- A) PID
- B) Infertility
- C) Cancer of the rectum
- D) Still births

5.5 Assertion: Persons in the age group between 15-24 years is more vulnerable to sexually transmitted infections.

Reason: People in reproductive age get sexually transmitted infections during sexual intercourse with their partner.

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

ANSWERS- 5.1-C , 5.2- C, 5.3-D, 5.4-C, 5.5-C)

6. ORAL CONTRACEPTIVES

Oral Contraceptives are in the form of pills that are either progestogens (progesterone) or a progestin- estrogen combination. These are female contraceptives administered for 21 days in a month. Saheli is world's first and only oral non-steroidal

contraceptive pill. 'Saheli' aka Centchroman (ormeloxifene 30mg) is the only non-steroidal pill with zero side effects available in the world. The Government of India guidelines for Emergency Contraception recommend use of Levonorgestrel (progestogen only) NG 0.75 mg as a "dedicated product" for effective emergency contraception. The Drug Controller of India has approved only Levonorgestrel for use as ECP.

6.1 OCs are taken for a period of days, starting within the first days of menstrual cycle and after a gap of days during which menstruation occurs it is repeated every month.(fill in the blanks)

A) 21, 7, 5

B) 5, 7, 21

C) 21, 5, 7

D) None of the above

6.2 Saheli- an OC has the following features- It is non steroidal. It has many side effects. It is once a week pill. It has low contraceptive value.

A) True

B) False

C) Not sure

6.3 Which is not true about the mode of action of OCs?

A) They inhibit ovulation.

B) They suppress sperm motility and fertilizing capacity of sperms

C) They alter the quality of cervical mucus to retard sperms.

D) They inhibit implantation.

6.4 OCs contain –

A) Progesterone only

B) A combination of oestrogen and progesterone

C) None of the above

D) Both the above

6.5 Assertion: Emergency contraceptives are used to avoid pregnancy due to casual unprotected sex or due to rape. Reason: These are very effective if given within 72 hours of unprotected sex.

A) Both Assertion and Reason are true and the Reason is correct explanation of the Assertion

. B) Both Assertion and Reason are true but the Reason is not a correct explanation of the Assertion.

C) Assertion is true but the Reason is false.

D) Both Assertion and Reason are false.

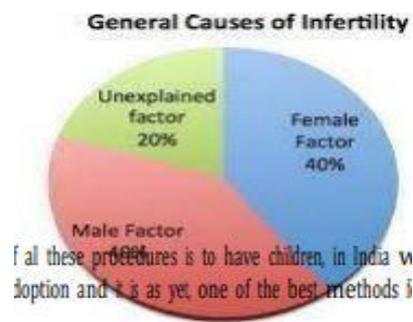
ANSWERS- 6.1-C, 6.2-B , 6.3-B , 6.4-D ,6.5-A)

Competency Based Questions

INFERTILITY-

A large number of couples all over the world including India are infertile, i.e., they are unable to produce children in spite of unprotected sexual cohabitation. In the opinion of the Indian Society of Assisted Reproduction, about 10 to 14 % of Indians are infertile which amounts to about 27.5 million couples struggling with their dreams of starting a family and raising a child. Female infertility - 30-40% Male infertility- 30-40%. The reasons for this could be many—physical, congenital, diseases, drugs, immunological or even psychological. Specialized health care units (infertility clinics, etc.) could help in diagnosis and corrective treatment of some of these disorders and enable these couples to have children. However, where such corrections are not possible, the couples could be assisted to have children through certain special techniques commonly known as assisted reproductive

technologies (ART). All these techniques require extremely high precision handling by specialized professionals and expensive instrumentation. Therefore, these facilities are presently available only in very few centres in the country. Obviously their benefits are affordable to only a limited number of people. Emotional, religious and social factors are also deterrents in the adoption of these methods. Since the ultimate aim of all these procedures is to have children, in India we have so many orphaned and destitute children, who would probably not survive till maturity, unless taken care of. Our laws permit legal adoption and it is as yet, one of the best methods for couples looking for parenthood.



7.1 A woman has blockage in fallopian tubes which cannot be treated. Which ART would you suggest to this couple for becoming parents?

- A) GIFT (Gamete Intra fallopian transfer)
- B) ZIFT (Zygote intra fallopian transfer)
- C) IUT (Intra uterine transfer)
- D) Any of the above

7.2 A male who cannot produce sufficient number of motile and functional sperms can have a baby by adopting which technique (suggest the best and cost effective technique)-

- A) GIFT (Gamete Intra fallopian transfer)
- B) ZIFT (Zygote intra fallopian transfer)

C) ET (Embryo transfer)

D) All of the above

7.3 A couple produces functional gametes but the female is unable provide conditions for fertilization of gametes .Which technique would you suggest to the couple to have a baby?

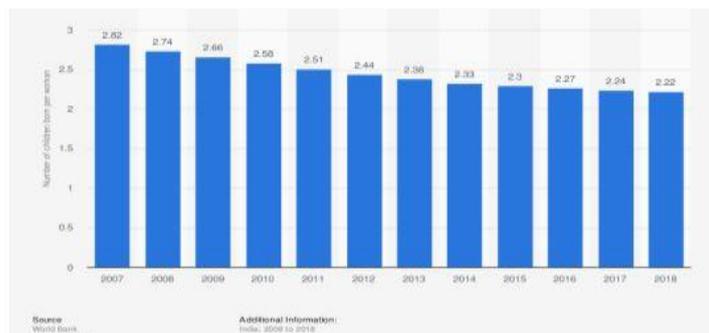
A) GIFT (Gamete Intra fallopian transfer)

B) ZIFT (Zygote intra fallopian transfer)

C) AI (artificial insemination)

D) None of the above

7.4 Observe the following graph .The TFR (total fertility rate) is declining on our country from 2007- 2018.



Which of the following is a reason for infertility in India?

A) Psychological problems

B) Immunological problems

C) Congenital problems

D) All the above

7.5 Assertion: Women in India are often blamed if a couple is child less.

Reason: In a male dominating society like ours, women are blamed whereas problem always lies with the male partner

. A) Both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

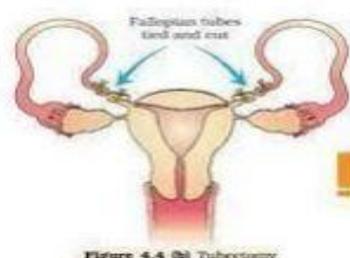
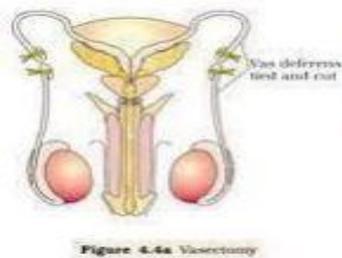
B) Both Assertion and Reason are true but the Reason is not a correct explanation of the Assertion.

C) Assertion is true but the Reason is false.

D) Both Assertion and Reason are false.

ANSWERS- 7.1- C, 7.2-A ,7.3-B ,7.4-D ,7.5- C) 8.

SURGICAL METHODS-



Observe the given picture and answer to the following questions

8.1 A woman went to the doctor for permanent contraceptive method as she already has two children. The doctor advised her permanent method of contraception and explained her procedure, which is

A) tubectomy ,where both the oviducts are cut and tied.

B) Vasectomy, where both the vas deferens are cut and tied.

C) Oral emergency contraceptives

D) None of the above

8.2 Removal of gonads is not a method of contraception because

A) It stops gametogenesis for ever.

B) It alters the sex hormonal balance in the body.

C) It makes the person infertile

D) All the above

8.3 Why are both the vas deferens cut and tied in vasectomy?

A) To stop the transport of sperms out to the female reproductive tract.

B) To stop the sperm from fertilizing the secondary oocyte in oviduct.

C) To stop sperm production.

D) All the above

8.4 Which of the following point is true about surgical methods of contraception?

A) Highly effective and reversible and can be performed by quacks also.

B) Less effective, irreversible and can be done only by qualified doctors.

C) Highly effective and irreversible so terminal method of contraception performed by qualified doctors.

D) Highly effective, reversible with few side effects.

8.5 Assertion: Widespread use of contraceptive is an effective method to control population growth but it has possible ill effects also. Reason: It can lead to conflicts between couples about when to have a child and how many to produce.

A) Both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

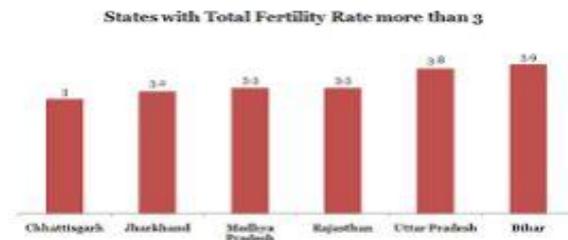
B) Both Assertion and Reason are true but the Reason is not a correct explanation of the Assertion.

C) Assertion is true but the Reason is false.

D) Both Assertion and Reason are false.

(ANSWER- 8.1-A, 8.2-D, 8.3-A, 8.4-C, 8.5

9. POPULATION EXPLOSION



9.1 Observe the graph showing total fertility rates (TFR) across various states in India. Which state has maximum TFR?

- A) Uttar Pradesh
- B) Bihar
- C) Rajasthan
- D) Chhattisgarh

9.2 There is population explosion in the state which has highest TFR. So, what steps the state authorities must take to control population?

- A) Use mass media to educate people about advantages of small family.
- B) Distribute free contraceptives- condoms, IUDs, OCs.
- C) Declare and popularise various incentives for small families.
- D) All the above.

9.3 What could be the possible reasons for population explosion in that state?

- A) Decline in death rate, IMR, MMR.
- B) Increase in number of people in reproductive age.
- C) Increase in birth rate.
- D) All the above.

9.4 What are the problems that this state is facing due to population explosion?

- A) Shortage of basic requirements like food, shelter and clothing
- B) More working hands means more income.
- C) Better standard of living of people with more children
- . D) All the above.

9.5 If more and more couples in this state become infertile, then problem of population explosion can be solved?

- A) True
- B) False

ANSWERS- 9.1-B, 9.2-D, 9.3-D , 9.4-A , 9.5-B)

OTHER MULTIPLE-CHOICE QUESTIONS

1. Which of the following STDs is completely curable if timely and proper treatment is sought?

- A) HIV- AIDS

B) Genital herpes

C) Hepatitis-B

D) Chancroid

2. Mention the precautions that the vulnerable age group people should take to avoid contracting the STDs

A) Avoid sex with unknown and multiple partners.

B) Use condoms during coitus

C) Consult a qualified doctor in case of symptoms

D) All the above

3. Which of the following is not a mode of action of IUDs?

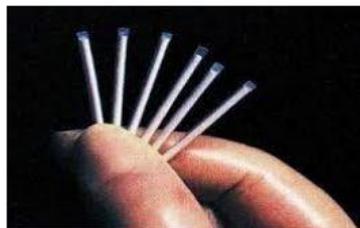
A) Increase phagocytosis of sperms

B) Inhibit ovulation

C) Make the cervix hostile to sperms and uterus unsuitable for implantation.

D) Suppress sperm motility and fertilizing capacity of sperms.

4.



4.1 Identify this contraceptive used by females

A) Injectables

B) Implants

C) Emergency contraceptive

d) Oral contraceptive

4.2 What is the basic chemical composition present in above contraceptive which makes it a n effective contraceptive?

- A) Steroid hormones-Progesterone alone or combination with estrogen.
- B) Copper ions
- C) Both the above
- D) None of the above

5. What is the difference between implants and oral contraceptives?

- A) Implants are effective for longer duration.
- B) Implants are inserted under the skin; need not be remembered and taken daily.
- C) Both A and B
- D) None of the above

ANSWERS- 1-D, 2- D, 3- B, 4.1-B, 4.2-A, 5- C

CHAPTER -5: PRINCIPLES OF INHERITANCE AND VARIATION

1. Haemophilia is a-----

- a) deficiency disorder.
- b) y- sex linked disorder
- c) x- sex linked disorder
- d) Autosomal disorder

2.klinefelter syndrome is due to-----

- a) One x and two y
- b) Two X and one y
- c) One x only
- d) One y only

Ans- 1.c, 2-b

1.Sickle cell anemia is caused

- a) When valine is replaced by glutamic acid in beta polypeptide chain
- b) When glutamic acid is replaced by valine in beta polypeptide chain
- c) When glutamic acid is replaced by valine in alpha polypeptide chain
- d) When valine is replaced by glutamic acid in alpha polypeptide chain

2.Arrange the following events in the order of synthesis of a protein

- i) A peptide bond forms
- ii) A tRNA matches its anticodon to the codon in the A- site
- iii) The movement of second tRNA complex from A-site to P-site
- iv) The large subunit attaches to the small subunit and the initiator tRNA fits in the P-site
- v) A small subunit binds to the mRNA
- vi) The activated amino acid tRNA complex attaches the initiation codon on mRNA

- a) iv, v, iii, ii, i, vi
- b) iv, vi, v, ii, i, iii
- c) v, iv, iii, ii, vi, i
- d) v, vi, iv, ii, i, iii

3.Read the following and select the correct statement/statements.

- (i) 23 s RNA act as a enzyme in prokaryotes.
- (ii) In prokaryotes DNA is monocistronic
- (iii) Francis Crick proposed the Central Dogma of Molecular biology.
- (iv) In Eukaryotes three types of RNA polymerases are present.

- a) a only
- b) a and b
- c) a and c
- d) a and d

4. The significant aspect of reverse transcription is :

- (a) the flow information from DNA to RNA

- (b) the flow information from RNA to DNA
- (c) the flow information from RNA to proteins
- (d) both a and c

5. Match the names of scientists in column I with their achievements in column II and choose the correct answer given below

Column I Column II

- | | |
|----------------------|--------------------------|
| A) Watson and Crick | P) DNA fingerprinting |
| B) R. W. Holley | Q) Decipher genetic code |
| C) Marshal Nirenberg | R) Double helix of DNA |
| D) Jacob and Monod | S) Clover model of tRNA |
| E) Alec Jeffrey | T) Lac operon concept |
- (A) (B) (C) (D) (E)

- a) R S P T Q
- b) R S Q T P
- c) R Q P T S
- d) R T S P Q

6) Assertion: Transcription is the mode in which DNA passes its genetic information to RNA.

Reason: Transcription takes place in the cytoplasm of eukaryotic cells.

7) Assertion: Enzymes required for DNA replication are efficient enzymes

Reason: They can polymerise large number of nucleotides in very short time

8) Assertion: The two strands of DNA are antiparallel

Reason: Only antiparallel polynucleotides form a stable double helix.

9) Assertion (A): DNA replication occurs in small replication forks and not in its entire length.

Reason(R): Replication of DNA does not initiate randomly and DNA polymerases on their own cannot initiate replication.

10) Assertion (A): tRNA is called an 'adapter'

Reason(R): tRNA on one hand bind to a specific amino acid and on the other hand reads the codon of the amino acid bound to it through its anticodon

11) DNA: More than just a super hard drive

Bill Gates, one of the founders of Microsoft, declared, 'DNA is like a computer program but far, far more advanced than any software ever created.

Actually, DNA is far more complicated than simply coding for proteins, as we are discovering all the time. For example, because the DNA letters are read in groups of three, it makes a huge difference which letter we start from. E. g. the sequence GTTCAACGCTGAA ... can be read from the first letter, GTT CAA CGC TGA A ... but a totally different protein will result from starting from the

second letter, TTC AAC GCT GAA ...

This means that DNA can be an even more compact information storage system. This partly explains the surprising finding of The Human Genome Project that there are 'only' about 35,000 genes, when humans can manufacture over 100,000 proteins. Bacteria and yeast are the most commonly used hosts for the process of cloning in Human Genome Project. Not all types of fungi can be used for this process. But yeast and bacterium can be employed. Both BAC (Bacterial Artificial Chromosomes) and YAC (Yeast Artificial Chromosomes) act as a suitable vector for the process of cloning in HGP whereas bacteria and yeast act as the host for cloning in HGP. The methodologies for the HGP are involved in two major processes. One among them is ESTs (Expressed Sequence Tags). It is used to identify all the genes that are expressed as RNA in HGP. When one base pair is stacked over the other in a helical fashion, the DNA will be stable. A right-handed curving fashion is seen in the DNA. When repeating structures are present, the DNA will not be stable. The sum of Purines, A and G, is equal to the sum of Pyrimidines, C and T (i. e. , A+G = C+T). Adenine and Thymine form a double hydrogen bond. Likewise, Guanine and Cytosine form a triple hydrogen bond. The resistance showed by thymine towards all the photochemical mutations is what makes the DNA more stable.

11) (i) Which is the correct complementary strand for AGAATTCGC?

- a) CTCCGGATA
- b) GAGGCCTAT
- c) TCTTAAGCG
- d) GTGGCCATA

11) (ii) Which of the following methodology is used to identify all the genes that are expressed as RNA in Human Genome Project (HGP)?

- a) Sequence Annotation
- b) Expressed Sequence Tags
- c) Karyotyping
- d) Ammonification.

11) (iii) Which of the following is a suitable host for the process of cloning in Human Genome Project (HGP)?

- a) Virus
- b) All types of fungi
- c) Bacteria
- d) Protozoan

11) (iv) Which of the following ensures the stability of the helical structure of a DNA?

- a) Presence of repetitive structures of a DNA code
- b) Stacking of one base pair over the other
- c) Presence of aneuploidy
- d) Occurrence of chromosomal rearrangements

Q12 Prokaryotic Transcriptional Activators and Repressors

The organization of prokaryotic genes in their genome is notably different

from that of eukaryotes. Prokaryotic genes are organized, such that the genes for proteins involved in the same biochemical process or function are located together in groups. This group of genes, along with their regulatory elements, are collectively known as an operon. The functional genes in an operon are transcribed together to give a single strand of mRNA known as polycistronic mRNA.

Transcription of prokaryotic genes in an operon is regulated by two types of DNA binding proteins known as activators and repressors. Activators bind to the promoter, the site of transcription initiation, and aid in the binding of RNA polymerase, the key enzyme involved in transcription. Repressors bind to operators, short regulatory sequences in the operon between the promoter and the genes, and inhibit the binding of RNA polymerase to the promoter.

A structural pre-requisite for activators and promoters is that they should be able to exist in two alternate conformations, one where they can bind to the DNA and one where they cannot. Another characteristic feature specific to activators is that they have two binding surfaces to simultaneously bind to both RNA polymerase and DNA. This recruitment of the two molecules brings the polymerase closer to the promoter and aids in its binding. Activators have no catalytic role to play in transcription and their function is limited to facilitating the binding of the enzyme and DNA. In the absence of an activator, RNA polymerase can still bind to DNA and show low levels of expression. If a repressor is present in this system, then the basal expression of that gene is prevented.

Regulation of the expression of prokaryotic genes is largely dependent on the nutrient availability and requirements of the organisms. These nutrients control the binding of activators and repressors to the operon and ensure that only the required set of genes is expressed. Operons are usually either inducible or repressible. Inducible operons, such as the bacterial lac operon, are normally “off” but will turn “on” in the presence of a small molecule called an inducer (e. g. , allolactose). When glucose is absent, but lactose is present, allolactose binds and inactivates the lac operon repressor—allowing the operon to generate enzymes responsible for lactose metabolism.

Repressible operons, such as the bacterial trp operon, are usually “on” but will turn “off” in the presence of a small molecule called a corepressor (e. g. , tryptophan). When tryptophan—an essential amino acid—is abundant, tryptophan binds and activates the trp repressor—preventing the operon from making enzymes required for its synthesis. For example, the presence of tryptophan in a cell leads to its binding to a repressor which prevents the transcription of the trp operon and subsequent production of tryptophan.

Q12 (i) Which of the following statements is true about gene regulation in bacteria?

- A. Activator proteins bind near promoters and increase efficiency of translation
- B. Small-molecule “sensors” usually bind DNA and change its 3D structure allosterically.
- C. Genes with related functions are often grouped together and have a single start codon.

- D. Repressor proteins block transcription by binding to operator sequences.
- E. Enhancers are commonly used to regulate transcription.

Q12 (ii) Repressors are active only when they are at the proximity of the RNA polymerase as they directly associate with the pre-initiation complex. State whether this is true or false.

- A) True
- B) False

Q12 (iii) In bacteria, transcription is initiated by DNA Polymerase.

- A) True
- B) False

Q12 (iv) In addition to the RNA Polymerase, there are also a number of DNA Binding proteins that facilitate the process of transcription.

- A) True
- B) False

1. . (b) When glutamic acid is replaced by valine in beta polypeptide chain
2. (d) v, vi, iv, ii, i, iii
3. (a) 23 s RNA act as a enzyme in prokaryotes
(d) In Eukaryotes three types of RNA polymerases are present.
4. (b) the flow information from RNA to DNA
5. (b) R S Q T P
6. **Ans. C** transcription takes place in the membrane-bounded nucleus
7. **Ans. A** An enzyme is a molecule that speeds up a reaction. In the case of DNA reproduction, enzymes not only speed up the reaction, they are necessary for DNA reproduction. One half of the strand is then used as a template to build a new strand of DNA. The enzyme helicase is responsible for splitting DNA along the base pairs.
8. **Ans. A** The nitrogen bases can only pair in a certain way: A pairing with T and C pairing with G. Due to the base pairing, the DNA strands are complementary to each other, run in opposite directions, and are called antiparallel strands.
9. **Ans. B** Replication of DNA occurs in small replication fork, because DNA is a such a long molecule that the separation of the two strands along its entire length requires a very high amount of energy. The DNA polymerase enzymes cannot initiate the process of replication on their own. The process of replication will also not randomly occur on any strand of the DNA, specific regions will be present. These regions are called as the origin of replication.

10. **Ans. A** Since tRNA on one hand binds to a specific amino acid and on the other hand reads the codon of the amino acid bound to it through its anticodon, it is called an 'adapter'.

11) (i) **Ans. C** Adenine and Thymine form a double hydrogen bond. Likewise, Guanine and Cytosine form a triple hydrogen bond. So, the correct complementary strand for AGAATTCGC is TCTTAAGCG.

(ii) **Ans. B** The methodologies for the HGP are involved in two major processes.

One among them is ESTs (Expressed Sequence Tags). It is used to identify all the genes that are expressed as RNA in HGP.

(iii) **Ans. C:** Bacteria and yeast are the most commonly used hosts for the process of cloning in Human Genome Project. Not all types of fungi can be used for this process. But yeast and bacterium can be employed.

(iv) **Ans. B** When one base pair is stacked over the other in a helical fashion, the DNA will be stable. A right-handed curving fashion is seen in the DNA. When repeating structures are present, the DNA will not be stable. Aneuploidy is in relevance to the abnormality in the number of chromosomes. When chromosomal rearrangements occur, deletion, duplication, translocations and inversions may occur. There will not be any stability.

12) (i) **Ans. D** Repressor proteins block transcription by binding to operator sequences.

(ii) **Ans. B** A repressor is a protein that turns off the expression of one or more genes. The repressor protein works by binding to the gene's promoter region, preventing the production of mRNA. Repressors respond to external stimuli to prevent the binding of activating transcription factors.

(iii) **Ans. B** Bacterial transcription is the process in which a segment of bacterial DNA is copied into a newly synthesized strand of messenger RNA (mRNA) with use of the enzyme RNA polymerase.

(iv) Ans. A Transcription is carried out by an enzyme called RNA polymerase and a number of accessory proteins called transcription factors. Transcription factors can bind to specific DNA sequences called enhancer and promoter sequences in order to recruit RNA polymerase to an appropriate transcription site.

Test your knowledge

1. Who rediscovered the Mendel's work: -

- a. Correns
- b. Hugo de Vries
- c. Tschermak
- d. All of the above

2. In which year the Mendel's work has been published: -

- a. 1864
- b. 1865
- c. 1866
- d. 1867

3. Who has given the concept of gene mapping: -

- a. Morgan
- b. Gregor John Mendel
- c. Alfred Sturtevant
- d. Henking

4. Male heterogametic condition found in :-

- a. Human being
- b. Fowl

c. Both A & B

d. Not certain

5. Who invented X chromosomes:-

a. MacClintok

b. Johenson

c. Morgan

d. Henking

6. Trisomy found in:-

a. Turner's Syndrome

b. Klinefelter's syndrome

c. Down's Syndrome

d. All of the above

7. Failure of which stage of cytokinesis cause polyploidy:-

a. Prophase

b. Metaphase

c. Anaphase

d. Telophase

8. In phenylketonuria the amino acid phenylalanine fails to convert in which amino acid: -

a. Serine

b. Tyrosine

c. Glutamic Acid

d. Valine

9. In Sickle cell anemia , at which position , the amino acid get changed:-

- a. Fourth position
- b. Fifth position
- c. Sixth position
- d. Seventh position

10. If the diploid number of chromosomes are 32 in honey bees , then how many chromosomes found in the male honey bees or drones:-

- a. 16
- b. 32
- c.48
- d. 16 & 32 both

11. There is certain feminine features develop in an individual with XXY chromosomes configuration , then what is the suitable term can be given to the situation:-

- a. Gynaecomastia
- b. Gynaecophoria
- c. Gynaecoinducia
- d. Gynaecoblastia

12. Which of the following disease belong to autosomal recessive mendelian disorder:-

- a. Colour blindness
- b. Haemophilia
- c. Sickle cell anaemia
- d. All of the above

13. Incomplete Dominance , is the deviation of which law of Mendel:-

- a. Law of dominance
- b.Law of segregation

c. Law of independent assortment

d. All of the above

14. Pleiotropy, can be defined as:-

a. When one gene controls one trait

b. When one gene exhibits multiple traits

c. When multiple genes control one trait

d. When multiple genes control multiple traits.

15. Polygenic inheritance can be observed in:-

a. In the eye colour of human being

b. In the skin colour of human being

c. In the hair colour pattern

d. All of the above

16. In fowl, which parent is responsible to determine the sex of offspring's :-

a. Male parent

b. Female parent

c. Both parents

d. By environment conditions

17. In pea plants, the pod shape may be inflated or constricted, which trait is dominant trait:-

a. Inflated

b. Constricted

c. Both of them

d. Not certain

18. What would be the phenotype of a plant that has genotype Tt :-

- a. Tall
- b. Dwarf
- c. Semi dwarf
- d. Not certain

19. Out of sperms and ova , which gamete is responsible to determine sex in chick :-

- a. Sperm
- b. Ovum
- c. Both the gametes
- d. Depend upon environment conditions

20. What will be the percentage of pea plants that would be homozygous recessive in the F₂ generation , when tall F₁ heterozygous pea plants are selfed :-

- a. 25%
- b. 50%
- c. 75%
- d. 100%

21. What percentage of homozygous and heterogeous populations are produced in F₂ generation in a mendelian monohybrid cross :-

- a. 25% and 25%
- b. 50% and 50%
- c. 25% and 75%
- d. 25 % and 50%

22. Write the genotypes Mendel obtained , after the cross between f-1 violet flowered plants with white flowered pea plant:-

- a. VV & vv

b. $VV \& Vv$

c. $Vv \& Vv$

d. $Vv \& vv$

23. Which law of Mendel, has universally accepted

a. Law of dominance

b. Law of segregation

c. Law of independent assortment

d. None of these

24. $RrYy$ has been crossed with $rryy$. Give a suitable term of the cross:-

a. Monohybrid cross

b. Test cross

c. Back cross

d. Self cross

25. How many alleles are responsible to determine the skin colour of human being:-

a. 2 pairs

b. 3 pairs

c. 4 pairs

d. 5 pairs

26. In a population of *Drosophila*, 25% offsprings are similar to their parents, reason behind this similarity is :-

a. Recombination

b. Linkage

c. Variation

d. All of the above

27. In human being , the $2n=46$, how many linkage groups are found on it :-

- a. 23
- b. 46
- c. 23 pairs
- d. 46 pairs

28. In the male gamete of an organism 8 chromosomes are found .Out of which one is X chromosome. how many autosomes will be found in the gamete:-

- a. 7
- b. 8
- c. 14
- d. 16

29. Male honey bees produced by parthenogenesis, which type of cell division found during Gametogenesis of such male bees:-

- a. Mitosis
- b. Meiosis
- c. Amitosis
- d. All of the above

30. Which of the following is x linked recessive disease: -

- a. Sickle cell anemia
- b. .Thalassemia
- c. Phenylketonuria
- d. **Haemophilia**

31. Which of the following organism, has XO sex chromosome in male individuals: -

- a. Human being
- b. Fowl
- c. **Insects**
- d. None of the above

32. A human zygote has XXY sex chromosome along with 22 pairs of Autosome, what will be the sex of the individual the individual developing from the zygote:-

- a. Male
- b. Female
- c. Both A & B
- d. Not certain

33. There is a gene which is responsible to control the shape of the seeds and the size of the starch grains and the nature of protein coat around The Seed. Which type of gene it would be:-

- a. Polymorphic gene
- b. Pleiotropic gene
- c. Multiple genes
- d. All of the above

34. What are the number of chromosomes, retain the genes for Alpha thalassemia and beta thalassemia respectively:-

- a. 11 & 16
- b. 16 & 11
- c. 16 & 20
- d. 11 & 20

35. An individual human being has 45 chromosomes, which type of chromosomal disorders likely to occur: -

- a. Down's syndrome

- b. Turner's syndrome
- c. Klinefelter syndrome
- d. None of the above

36. A colour blind son born from normal parents, what would be the genotype of the maternal grandfather: -

- a. XcY
- b. $XcYc$
- c. XY
- d. None of the above

37. Mother's blood group is A and father's blood group is B and the daughter's blood group is O. What will be the blood group of other children?-

- a. A
- b. B
- c. AB
- d. All of the above

38. What are the outcome of gene mapping: -

- a. The chances of recombination
- b. The chances of linkage
- c. To locate at the proper locus of a gene
- d. All of the above

39. Phenylalanine hydroxylase enzyme, responsible to convert :-

- a. Phenylalanine to glutamic Acid
- b. Phenylalanine to valine
- c. Phenylalanine to tyrosine
- d. Phenylalanine to glycine

40. What is the phenomenon that occurred in the failure of separation of homologous chromosomes , during meiosis:-

- a. Non Isolation
- b. Non distinction
- c. Non disjunction
- d. Non separation

41. The genotype of affected individual with sickle cell anemia will be:-

- a. HbsHbs
- b. HbsHba
- c. HbaHba
- d. HbaHbs

42. During sickle cell anemia , in what form does the replacement can be seen in codon :-

- a. GAGto GTG
- b. GAGtoGUG
- c. GAGtoGCG
- d. GAG to CAG

43. A haemophilic son born to normal parents. Give the genotype of parents:-

- a. Mother XX father XCY
- b. Mother XhX , father XY
- c. Mother XX, father XY
- d. None of the above

44. Which of the following is not a wild type phenotype in drosophila:-

- a. Miniature wings
- b. White eye
- c. White body
- d. Normal wing

45. How many contrasting characters are found in the pea plants:-

- a. 5 pairs
- b. 6 pairs
- c. 7 pairs
- d. 8 pairs

46. In which year chromosomal theory of inheritance was postulated:

-

- a. 1900
- b. 901
- c. 1902
- d. 1903

47. How does mendelian disorders caused: -

- a. Due to defected autosomal gene
- b. Due to defected X linked gene
- c. Due to defected autosomal as well as X linked gene
- d. None of the above

48. In complete linkage, the off springs with recombination, in F2 generation are: -

- a. 1.1%
- b. 1.2%
- c. 1.3 %

d. 1.4%

49. In incomplete linkage, the offsprings with parental combination in F₂ generation are: -

a. 68.2%

b. 62.8%

c. 68.3%

d. 62.3 %

50. Two heterozygous parents are crossed. if two loci are linked what would be the distribution of phenotypic features in F₁ generation for a dihybrid cross: -

a. Complete linkage

b. Incomplete linkage

c. Partial complete linkage

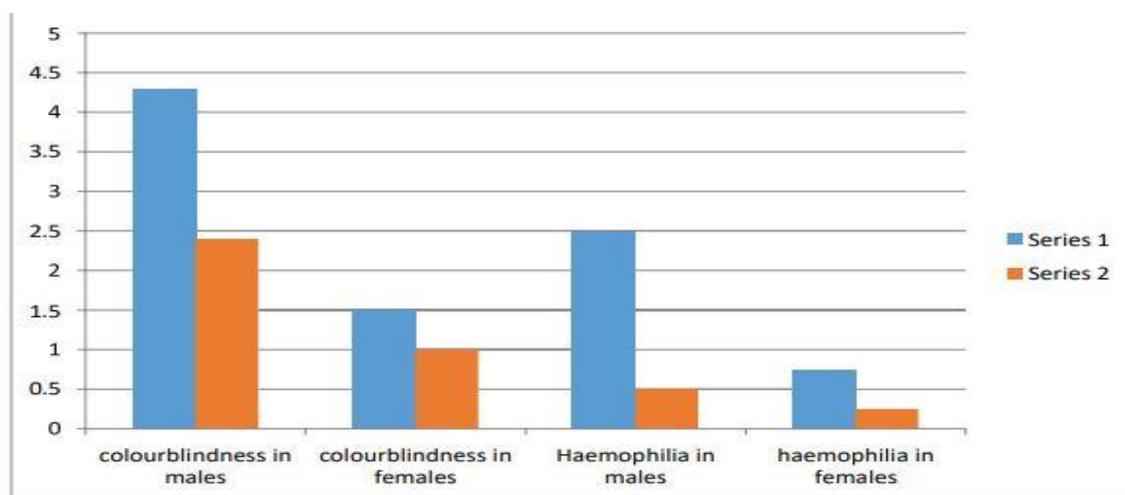
d. Partial incomplete linkage

CRITICAL & CREATIVE THINKING QUESTIONS: -

The chances of colour blindness about 8 % of males and only about .4 % of females. This is because the genes that lead to red green colour blindness are on the X chromosome. Males have only one X chromosome and females have 2. Another sex linked recessive disease, which shows its transmission from unaffected carrier female to some of the male progeny has been widely studied. In this disease a single protein that is a part of the cascade of proteins involved in the clotting of the blood is affected. Due to this in an affected individual a

simple cut will result in nonstop bleeding. The heterozygous female (carrier) for haemophilia may transmit the disease to sons. The possibility of a female becoming a haemophilic is extremely rare because mother of such a female has to be at least carrier and the father should be haemophilic. Note :- in each group bar 1 represent the individuals of less than 12 years of age. And bar 2 represent the individuals of more than 12 years of age.

GRAPH: DEPICTS THE VIABILITY OF INDIVIDUALS WITH X LINKED MENDELIAN DISORDERS



1. The reason for low viability of human females with haemophilia is :-
 - a. Non clotting of the blood
 - b. Loss of major volume of blood during menstruation.
 - c. Lack of the coagulating protein
 - d. All of the above.

2. What is the reason of the drastic loss of viability of affected males with haemophilia :-
 - a. Low volume of blood

- b. Lack of the clotting protein
 - c. Less platelet count
 - d. All of the above.
3. Which protein is responsible for coagulation of blood:-
- a. Fibrin
 - b. Albumin
 - c. Globulin
 - d. None of the above
4. Why the colour blindness is more common in male than females:-
- a. It is caused by a recessive gene.
 - b. It is located on X chromosome.
 - c. Female can be of heterozygous genotype.
 - d. All of the above.
5. How carrier mother may not inherit colour blindness to her offspring's: -
- a. Affected gene is only found on one X chromosome.
 - b. Mother may inherit normal X chromosome to the new generation.
 - c. Offsprings will be heterozygous genotype
 - . d. All of the above.

CASE BASE STUDY QUESTIONS: -

MENDELIAN DISORDERS Broadly, genetic disorders may be grouped into two categories – Mendelian disorders and Chromosomal disorders. Mendelian disorders are mainly determined by alteration or mutation in the single gene. These disorders are transmitted to the offspring on the same lines as we have studied in the principles of inheritance. Most common and prevalent Mendelian disorders are Haemophilia , Cystic fibrosis , Sickle cell anemia, Colour blindness , Phenylketonuria , Thalassemia. The Mendelian disorders may be

recessive or dominant. Similarly the trait may also be linked to the case of sex chromosome like haemophilia. It is evident that this X – linked recessive trait shows transmission from carrier female to male progeny. A Mendelian disorder caused if the mutated gene is found either in homozygous or in heterozygous forms. A recessive disease only expressed in the homozygous genotype , whereas the dominant diseases expressed in heterozygous genotype also. The defected gene may be found on to the autosome, like in thalassemia, the alpha type , gene is found on chromosome number 16 and beta type the gene is found on chromosome number 11. On the other hand when the defected gene is on X chromosome , then it will be considered as X linked diseases. Father never transmit or inherit the X linked diseases to the son , because from father —Y chromosome get inherited to his son and this chromosome not has any gene of the diseases.

1. Which disease is not Mendelian Disease :-

- a. Down's Syndrome
- b. Sickle cell Anemia
- c. Thalassemia
- d. Phenylketonuria

2. A female with gene of colour blindness may be normal , because :-

- a. One X chromosome has the defected /mutated gene
- b. Both X chromosomes have defected/mutated gene.
- c. Y chromosome has the defected/muted gene.
- d. Both A & B

3. A son not getting X linked Mendelian disease from affected father because :-

- a. The gene is located on X chromosome.
- b. Father inherit Y chromosome to his son.
- c. X chromosome is inherited to the daughter.

d. All of the above

4. Sickle cell Anemia and thalassemia are different from each other :-

- a. They created by autosomal genes
- . b. They are related to the disorder of blood.
- c. They are autosomal recessive diseases.
- d. Sickle cell anemia is qualitative and thalassemia is quantitative diseases.

5. Which two colours can not be identified in the colour blindness :-

- a. Blue & green
- b. Red & green
- c. Red & blue
- d. Violet & blue

CASE BASED STUDY QUESTIONS: -

PARTHENOGENESIS

In the population of honey bees, the male honey bees develop from unfertilized ovum, and the number of chromosomes found in the male bees are 16. The male honey bees are also called as drones. And they have half number of the chromosomes with respect to the females. Male bees are haploid and female bees are diploid. Female bees have 32 chromosomes. During Gametogenesis male bees perform mitosis , whereas the female bees perform meiosis. If we study the making of progeny among the honey bees , we found that the female bees make both male and female , and the male bees only make females. That is why the male not have father as well as male bees not have son. Meanwhile the male honeybees have grandfather and grandson as well.

- 1. Why mitosis not applicable during gametogenesis of female honeybees :-
 - a. Female bees are haploid.
 - b. Female bees are diploid.

- c. Female bees need to produce haploid offsprings.
 - d. Female bees need to produce male bees by parthenogenesis.
2. A male honey bee not has son because :-
- a. The male gamete are not in proper number
 - . b. The male gametes are not used to make male offsprings
 - c. The male gametes are yet to be in diploid chromosome number.
 - d. The female gamete develop in to a male bee directly.
3. What is the number of chromosomes in the queen honey bee :-
- a. 16
 - b. 32
 - c.48
 - d. Not certain
4. What is the role of the mitosis in the Gametogenesis in male honey bees :-
- a. It maintains haploid number of chromosomes.
 - b. Since the male bees are haploid , so meiosis is not needed.
 - c. For the making of the diploid offsprings
 - d. All of the above.

CASE BASE STUDY QUESTIONS:-

CO-DOMINANCE

In the case of co-dominance, the f-1 generation resembles both parents. A good example is different types of red blood cells that determine ABO blood grouping in human being. ABO blood groups are controlled by the gene I. The plasma membrane of the red blood cells has sugar polymers that protrude from its surface and the kind of sugar is controlled by the gene. The gene I has three alleles IA, IB and

i. The alleles I^A and I^B produce a slightly different form of the sugar while allele i does not produce any sugar. Because humans are diploid organisms, each person possesses any two of the three I gene alleles. I^A and I^B are completely dominant over i , in other words when I^A and i are present, I^A expresses. (because it does not produce any sugar), and when I^B and i are present I^B expresses. But when I^A and I^B are present together they both express their own types of sugars. This is because of co-dominance. Hence red blood cells have both A and B types of sugars. Since there are three different alleles, there are six different combinations of these three alleles that are possible, and therefore, a total of six different genotypes of the human ABO blood types.

1. The ploidy level of human being is :-

- a. Haploidy
- b. Diploidy
- c. Triploidy
- d. Not certain

2. Which of the following gene is not produce sugar:-

- a. I^A
- b. I^B
- c. $I^A I^B$
- d. i

3. How many types of sugars are found in red blood cells :-

- a. A type sugar
- b. B type sugar
- c. Both A & B type sugar
- d. A is rarely found and B is commonly found

4. How many alleles are responsible to determine blood group :-

- a. 2
- b. 3
- c. 4
- d. 5

5. How many types of genotypes are found to make the human blood group :-

- a. 4
- b. 5
- c. 6
- d. 7

Read the following Assertion and Reason based questions and select the most appropriate answer for the questions:-

- a. Assertion and reason both are correct, and reason is correct explanation of the assertion.
- b. Assertion and reason both are correct, and reason is not correct explanation of the assertion.
- c. Assertion is correct and reason is incorrect.
- d. Assertion is incorrect and reason is correct.

1. Assertion:- the point mutation is the substitution or replacement of a single nucleotide from DNA.

Reason: - Sickle cell anemia caused due to point mutation.

2. Assertion: - Colour Blindness caused due to a recessive gene , which is found in X chromosome.

Reason: - Colour blindness is an example of X linked Recessive disease

3. Assertion: - there are three pairs of alleles , which responsible to control the human skin colour.

Reason: - The inheritance of human skin colour called as Polygenic Inheritance.

4. Assertion :- The non disjunction of the homologous chromosome, is resulting as non proper distribution of the chromosomes.

Reason :- Down's Syndrome disease is caused due to the non disjunction of the chromosomes.

5. Assertion :- There are triple alleles, I^A , I^B , i responsible to control the blood group of human being.

Reason :- The controlling of one trait by number of alleles is called as multiple allelism.

6. Assertion :-when a pure red flowered and pure white flowered , dog flower plants are crossed together, pink flowered plants are produced in f-1 generation.

Reason :- this is the incomplete dominance , which create the pink colour of the flowers.

7. Assertion :- if the genotype is Tt , The phenotype of the pea plant is tall.

Reason :- Mendel's first law — law of Dominance — work to create phenotype in the heterozygous genotype.

8. Assertion :- The life span of Drosophila , is about 2 weeks.

Reason:- for the linkage , T. H. Morgan selected , Drosophila as an experimental insect.

9. Assertion :- Alfred Sturtevant , used the frequency of recombination, to measure the distance between genes.

Reason:- more frequency of recombination means , genes are located farther , low frequency of recombination means genes are located nearer.

10. Assertion :-In fowls , the female has ZW and male has ZZ sex chromosome.

Reason :- the sex determination in the fowls is done by the female, not by the male parent.

11. Assertion :- The male honey bees or the drones produced by parthenogenesis.

Reason :- Male honey bees perform mitosis during Gametogenesis.

12. Assertion :- In human female , XX is the sex chromosomal configuration.

Reason :- The determination of the sex is done by both the parents .

13. Assertion :- in phenylketonuria , phenyl alanine is excreted by help of urine.

Reason :- Phenyl alanine has poor absorption , by the kidney.

14. Assertion :- The possibility of a female becoming a haemophilic is extremely rare.

Reason :- mother must be at least carrier and father must be affected by the disease.

15. Assertion :- beta thalassemia , production of beta chain affected.

Reason:- it caused due to mutation in one or both genes on chromosome no. 16.

16. Assertion :- Chromosomal disorders can be classified into aneuploidy or polyploidy.

Reason :- Chromosomal disorders can be caused either gaining of extra copy number of chromosomes or an increase in a whole set of chromosome .

17. Assertion:- A male child can not be affected by colourblindness.

Reason:-mother isa carrier for colour blindness.

18. Assertion :- a female individual has rudimentary or non functional ovaries.

Reason:- Sterility of the female caused due to the Turner's Syndrome.

19. Assertion :- Genes and chromosomes have parallel behavior.
Reason :- Sutton & Boveri introduced chromosomal theory of inheritance to prove it.

20. Assertion :- The work of Mendel , remain , unrecognized till 1900.

Reason :- Expression of the traits , did not blend with each other , was not accepted by his contemporaries.

Study the following diagrams and give the answer of the following questions :-



1. Which disease is represented in the karyotype :-
 - a. Turner's Syndrome
 - b. Klinefelter's Syndrome
 - c. Down's Syndrome
 - d. None of the above
2. Which pair of chromosome karyotype is representing the defect:-
 - a. 20th pair
 - b. 21st pair
 - c. 22nd pair
 - d. 23rd pair
3. What is the term used for such triple chromosomal condition :-
 - a. Triploidy
 - b. Trisomy

c. Triple chromosomes

d. All of the above

4. Select the most appropriate symptoms of the disease :-

a. Big and wrinkled tongue

b. Broad flat face

c. Congenital heart disease

d. All of the above

5. Why this condition appeared :-

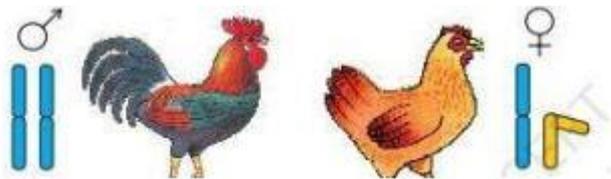
a. Due to failure of segregation of chromosomes

b. Due to Aneuploidy

c. Due to an additional chromosome

d. All of the above

Study the following diagram and answer the question: -



6. Mention the chromosomes in the male and female bird respectively:-

a. XY & XX

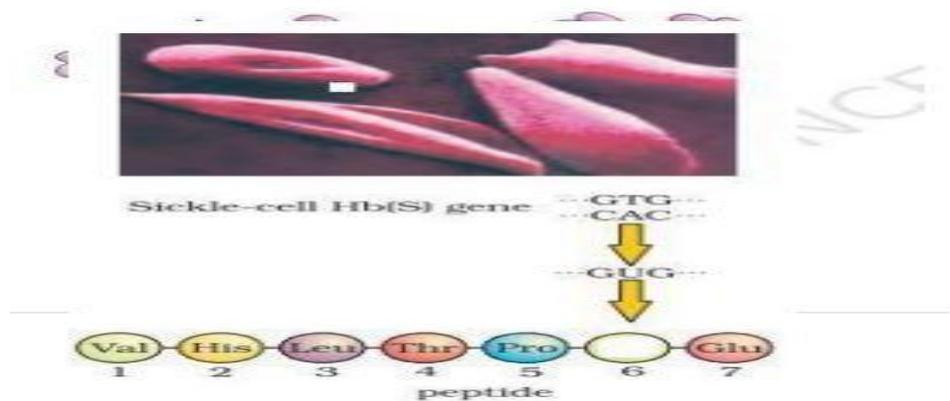
b. XO & XX

c. ZZ & ZW

d. ZW & ZZ

7. Which is the dominant trait of the position of flower: -

- a. Terminal
 - b. Axial
 - c. Lateral
 - d. Sub terminal
8. Which amino acid found at sixth position: -



- a. Glutamic Acid
 - b. Valine
 - c. Glycine
 - d. Serine
9. GUG codon is found in: -
- a. DNA
 - b. t RNA
 - c. r RNA
 - d. m RNA
10. Which type of polypeptide is found at the end :-
- a. HbA Polypeptide
 - b. HbS Polypeptide
 - c. Both A & B

d. Normal Polypeptide

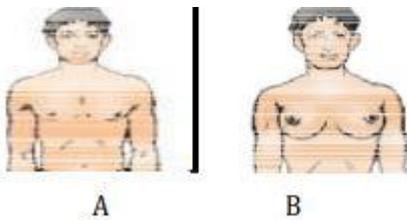
11. Which type of disease , does the sickle cell anemia is :-

- a. Autosomal Recessive disorder
- b. Autosomal Dominant Disorder
- c. X linked Recessive Disorder
- d. X linked Dominant Disorder

12. In the Hb(S) gene , which triple nucleotide , make codon GUG :-

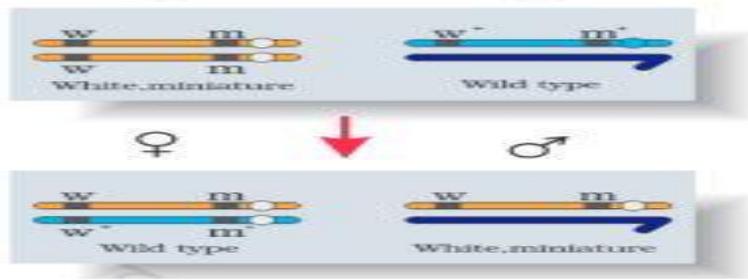
- a. GTG
- b. CAC
- c. Both A & B
- d. None of the above

13. Which individual exhibit Gynaecomastia:-



- a. A
- b. B
- c. Both A & B
- d. None of the above

14. Which type of cross is depicted in the above mentioned diagram: -



- a. Complete linkage
- b. Incomplete linkage
- c. Incomplete dominance
- d. Co-dominance

CHAPTER -6: MOLECULAR BASIS OF INHERITANCE

1 In a DNA strand, the nucleotides are linked together by-

- (a) glycosidic bonds
- (b) phosphodiester bonds
- (c) peptide bonds
- (d) hydrogen bonds

2 The size of DNA of bacteriophage lambda is

- (a) 50000 bp
- (b) 48502 bp
- (c) 48602 bp
- (d) 58000 bp

3 Nucleic acid is a polymer of

- (a) Nucleoside
- (b) Nitrogenous bases
- (c) Phosphate gp
- (d) Nucleotides.

4 The component of nucleoside are

- (a) Pentose sugar, phosphate gp

(b) Pentose sugar , Nitrogenous base

(c) Nitrogenous base, Phosphate group

(d) None of the above

5 Nucleotide contains

(a) Pentose sugar, nitrogenous base, phosphate group

(b) Pentose sugar , nitrogenous base

(c) Nitrogenous base, phosphate gp

(d) None

6 Adenine pairs with thymine with

(a) 1 hydrogen bond

(b) 2 hydrogen bond

(c) 3 hydrogen bond

(d) 4 hydrogen bond

7 Cytosine pairs with guanine

(a) 3 hydrogen bond

(b) 2 hydrogen bond

(c) 1 hydrogen bond

(d) 4 hydrogen bond

8 Nitrogenous bases present in DNA are

(a) Adenine, Guanine, Cytosine, Uracil

(b) Adenine, Guanine, Cytosine, Thymine

(c) Adenine, Guanine, Cytosine

(d) Guanine, Cytosine, Uracil

9 Which statement about Polynucleotide chain is not true?

a) a nucleoside has three components- nitrogenous base, pentose sugar and phosphate group

(b) Adenine and Guanosine are Purines

(c) two nucleotides are joined by Phospho-di-ester linkage to form dinucleotide

(d) a polynucleotide has a free phosphate moiety and - OH at two opposite ends

10 Which of the following is not true of DNA double helix structure?

(a) two nucleotides have anti-parallel polarity

(b) bases in two strands are linked by Hydrogen bonds

(c) Two chains are coiled in a left handed fashion

(d) pitch of the helix is 3.4 nm

11 When & Who discovered double helical model of DNA. Identify the correct option.

(a) 1952, Rosalind Franklin & Maurice Wilkins

(b) 1953, Watson & Crick

(c) 1953, Watson & Rosalind Franklin

(d) 1955, Watson & Rosalind Franklin

12 Central dogma states that genetic information flows from

(a) DNA - RNA - Protein

b. RNA- Protein- DNA

c. Protein-RNA-DNA

d. RNA- DNA-Protein

13 Find the correct statement from below

(a) In prokaryotes, DNA being positively charged is held by some negatively charged proteins to form nucleoid

(b) in eukaryotes, there is a set of negatively charged proteins called histones

(c) Histones are rich in lysine and Arginine residues

(d) 6 molecules of histones with DNA forms nucleosome

14 The size of nucleosome

- a) 20 bp
- b) 200bp
- c) 250 bp
- d) 150 bp

15 Which of the following statement is not correct?

- a) DNA is positively charged
- b) Histone proteins are positively charged
- c) Histone proteins are rich in lysine & Arginine
- d) Euchromatin is transcriptionally active

16 Identify the incorrect statement regarding transforming principle .

- a) Done by Frederick Griffith in 1928
- b) Used Streptococcus bacteria
- c) S strain is non virulent
- d) Experimental organism is mice

17 Biochemical characterisation of transforming principle is done by

- a) Avery ,McLeod & McCarty
- b) Frederick Griffith
- c) Avery & McCleod
- d) None

18 Identify the incorrect statement regarding Hershey & Chase experiment

- a) Experiment proves that DNA is the genetic material.
- b) They used bacteriophage
- c) Protein labelled with ^{32}P & DNA with ^{35}S

d) Bacteriophage is a virus.

19 A genetic material must fulfill certain criteria. Which one of the following is not such a criterion.

a) It should Replicate

b) It should be chemically and Physically stable

c) It should mutate fast required for evolution

d) It should express in the form of Mendelian Characters

20 In a DNA helix, the distance between two consecutive bases on the same chain is

a) 2 nm

b) 3.4 nm

c) 0.34 nm

d) 34 nm

21 The term used by Mendel for inheritance molecules

a) Genes

b) Factors

c) Alleles

d) None

22 Identify the incorrect statement

a) Purines are Adenine & Guanine

b) Pyrimidines are Cytosine, Thymine, Adenine

c) Adenine pairs with thymine by 2 Hydrogen bonds

d) Guanine pairs with cytosine by 3 hydrogen bonds.

23 RNA is labile due to presence of

a) Hydroxyl group at 2' C in Ribose sugar

- b) OH at 2' C in Ribose sugar
- c) OH at 2'C in Deoxyribose sugar
- d) None of the above

24 Which of the genetic material mutate at faster rate?

- a)RNA
- b)DNA
- c)Both
- d)None

25 DNA is structurally stable due to .

- a)Presence of thymine
- b)Presence of uracil
- c)Presence of adenine
- d)None

26 The first genetic material is

- (a) Protein
- (b) Carbohydrates
- (c)DNA
- (d) RNA

27 what is hnrna

- a)human rna
- b)hyper nuclear rna
- c)heteronuclear rna
- d)heterogeneous nuclear rna

28 what will be the effect of this experiment on rat

- (a)rat coat becomes smooth

(b) rat dies

(c) rat is unaffected

(D) rat body show phagocytosis and no pneumonia

29 The promoter site and terminator site for transcription are located at-

(a) 3(downstream) end and 5'(upstream) end respectively oftranscription unit (

b) 5"(upstream) end and 3 (downstream) end respectively oftranscription unit

(c) 5 (upstream) end

(d) 3' (downstream) end

30 With regard to mature mRNA in eukaryotes, which of the following is true ?

(a) Exons and introns do not appear in the mature RNA

(b) Exons appear but introns do not appear in the mature mRNA

(c) Introns appear but exons do not appear in the mature mRNA b se

(d) Both exons and introns appear in the mature mRNA

31 If the number of base pairs in a double stranded DNA is 200. The number of ADENINE is 60 then what will the numbers of GUANINE.

a)60

b)40

c)80

d)100

32 Discontinuous synthesis of DNA occurs on one strand because

(a) DNA molecule being synthesized 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 some role

33 Which of the following are the functions of RNA ?

(a) It is carrier of genetic information from DNA to ribosome synthesizing polypeptides

(b) It carries amino acids to ribosomes

c) It is constituent component of ribosomes

(d) All of the above

34 RNA polymerase II is responsible for the transcription of

(a) tRNA

b. r RNA

c. hnRNA

d. snRNA

35 In eukaryotic cell, transcription, RNA splicing and RNA capping take place in

(a) Nucleus

(b) Cytoplasm

(c) Ribosomes

(d) Golgi body

36 Choose Stop codons among the following:

a)UAA

b)UCA

c)UCC

d)UAC

37 Triplet UUU codes for

- (a) leucine
- (b) methionine
- (c) phenylalanine
- (d) glycine

38 A gene of operon which forms the repressor protein is

- (a) Operator
- (b) Promoter
- (c)Regulator
- (d) Structural

39 In the absence of lactose, the operator gene of lac-operon is suppressed by genetic material

- (a) Structural gene
- (b) Repressor protein
- c)Regulator gene
- (d) Promoter gene

40 Control of gene expression takes place at the level of

- (a) DNA replication
- (b) Transcription
- (c)Translation
- (d) None of these

41 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 region

(c) RNA polymerase binds to the operator.

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

42 Which of the following play a role in protein synthesis?

(a) Introns

(b) Exons

(c) Both (a) and (b)

(d) None of the above

44 Repressor protein is produced by

(a) Regulator gene

(b) Operator gene

(c) Structural gene

(d) Promoter gene

45 The protein of DNA, which contains information for an entire polypeptide is called as

(a) Cistron

(b) Muton

(c) Recon

(d) Operon

46 what is the first amino acid added during protein synthesis

a) glycine

b) methylene

c) methionine

d) valine

47 what is the type of centrifugation is used in meselson and stahl experiment

- a) cacl₂ density gradient centrifugation
- b) cscl density gradient centrifugation
- c) nacl density gradient centrifugation
- d) buffer mediated gradient centrifugation

48 if a person has VNTR of 10 nucleotides in his satellite dna of chromosome no 8 then what will be the VNTR of his son and daughter of that chromosome?

- a) both son and daughter will have the same.
- b) son will have 8 but daughter will have 4.
- c) it can't be determined.

49 satellite dna is an example of -----dna which shows dna ----- which is -- ----- in nature. Choose right sequences of the answers.

- a)genomic , inheritable , variable
- b)repetitive , polymorphism , variable
- c)polymorphism , variable, repetitive
- d)repetitive , polymorphism , inheritable

50 Identify the incorrect statement regarding DNA fingerprint

- a) Bulk DNA forms a major peak
- b) Satellite DNA is a repetitive
- c) Satellite DNA code for proteins
- d) Minisatellite & Microsatellite is a satellite DNA

ANSWER-

SR. NO	ANSWER	SR. NO	ANSWER	SR. NO	ANSWER
1	b	21	b	41	a
2	b	22	b	42	b
3	d	23	b	44	a
4	b	24	a	45	a
5	a	25	a	46	c
6	b	26	d	47	b
7	a	27	d	48	a
8	b	28	b	49	d
9	a	29	b	50	c
10	c	30	b		
11	c	31	b		
12	a	32	b		
13	c	33	d		
14	b	34	c		
15	c	35	b		
16	c	36	a		
17	a	37	c		
18	c	38	c		
19	c	39	b		
20	c	40	b		

TEST YOUR WISDOM

ASSERTION -REASON TYPE QUESTIONS:

These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any 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: Both deoxyribose and ribose belong to the same class of sugar called pentoses.

Reason : They differ only at the 3' C of the pentose sugar.

2 Assertion : DNA and histone proteins are both charged materials.
Reason : DNA is negatively charged and HISTONE proteins are positively charged.

3 Assertion: DNA is considered as stable genetic material than RNA .
Reason: It allows less mutation than RNA and it is double stranded.

4 Assertion: AUG codon has dual function. Reason : AUG acts as start codon and it codes for methionine.

5 Assertion: DNA replication is semi conservative in nature . Reason :
The new DNA formed has both strands newly formed.

6 Assertion: Mathew Meselson and Franklin Stahl performed experiment using Heavy N source in nutrition medium for the growth of bacteria.

Reason: Density gradient centrifugation was used to separate the heavy DNA particles.

7 Assertion: During DNA replication both strands are replicated in same direction.

Reason: DNA replication can do replication in any direction.

8 Assertion : Transcription takes place on the template strand.

Reason : The polarity of template strand is 3' to 5'.

11 Assertion: In prokaryotes transcription and translation takes place simultaneously.

Reason : There is no nuclear boundary in prokaryotes.

12 Assertion: The genetic code is degenerate.

Reason: Some amino acids are coded by more than one codon.

13 Assertion: Sickle-cell haemoglobin has a valine in place of glutamic acid at position 6 in the β polypeptide chain.

Reason: Sickle-cell anaemia is expressed only in homozygous recessive state.

14 Assertion: DNA fingerprinting is very well known for its application in paternity testing, in case of disputes.

Reason: It employs the principle of polymorphism in DNA sequences as the polymorphisms are inheritable from parents to children.

15 Assertion: Human Genome Project was a megaproject launched to find out the complete DNA sequence of human genome.

Reason: It was possible only with the help of genetic engineering techniques to isolate and clone any piece of DNA and fast techniques for determining DNA sequences

16 Assertion: Lactose in lac operon is INDUCER.

Reason: Lactose inactivates the repressor gene.

17 Assertion: No lac mRNA is made in the presence of glucose.

Reason: In the presence of glucose and lactose activity of lac operon is not needed.

18 Assertion : Genetic codon is nearly universal.

Reason :as from bacteria to human it codes for same amino acids with some exceptions like in mitochondrial codons.

19 Assertion: DNA finger printing is based on polymorphisms in repetitive DNA.

Reason: The polymorphisms are inheritable in nature.

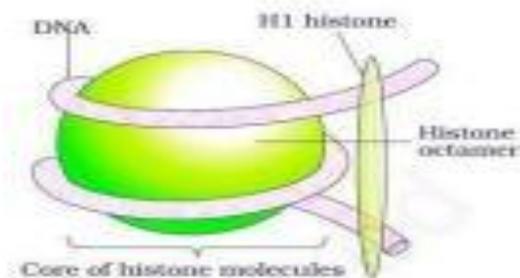
20 Assertion: 99.9% nucleotide bases are exactly the same in all people.

Reason: There are many locations where SNPs occur in human genome.

CASE STUDY /DIAGRAM BASED QUESTIONS

1. Observe following diagram and give answers.

i) Identify the structure in following diagram.



Structure?

- a) Ribosome
- b) Nucleosome
- c) Histosome
- d) Centrosome

ii) How many base pair of DNA Helix are found in the structure?

- a) 1000
- b) 500
- c) 200
- d) 100

iii) Which amino acid are found richly in histone protein.

- a) Glycine and Proline
- b) Proline and Arginine
- c) Lysine and Arginine
- d) Lysine and Glycine

iv) How many molecules are found in one Histone unit.

- a) 1
- b) 2

c) 4

d) 8

v) What is the chemical nature and charge of Histone protein.

a) Acidic and Positive

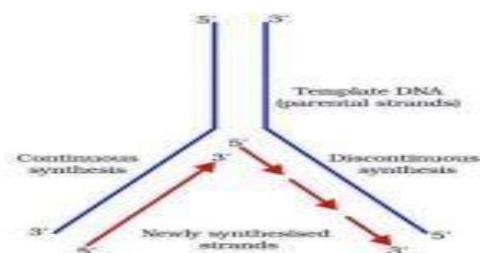
b) Basic and Negative

c) Basic and Positive

d) Acidic and Negative

2. Observe following diagram and give answers

. i) Identify the following diagram?



a) Replicating fork

b) ORI

c) Template strand

d) Coding strand

ii) Give the term for Starting point of Replication

a) ORI

b) ARS

c) ROP

d) SSB

iii) Give the term for DNA fragments produced by Discontinuous synthesis.

- a) Sokazaki Segment
- b) Mokazaki Segment
- c) Okazaki Segment
- d) Zokazaki Segment

iv) Give the name of enzyme which bind DNA fragments produced by Discontinuous synthesis.

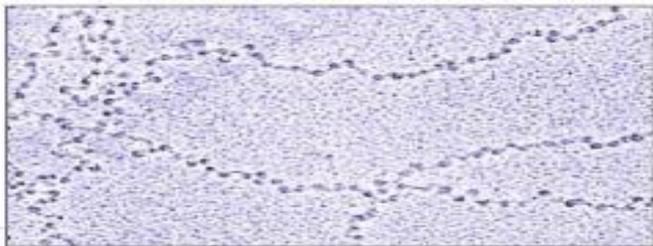
- a) DNA Ligase
- b) DNA Polymerase
- c) DNAase
- d) Endonuclease

v) In which stage of cell cycle this structure is formed.

- a) G1
- b) G2
- c) S
- d) M

3. Observe following diagram and give answers.

i) Identify the following diagram.



- a) EM Picture- Bead in String
- b) Nucleosome
- c) Linker DNA
- d) Histone

i) Give the term for Regions in given structure which are loosely packed and stains lightly.

- a) Heterochromatin
- b) Euchromatin
- c) Pseudochromatin
- d) None of above

iii) Give the term for Regions in given structure which are densely packed and stains dark.

- a) Heterochromatin
- b) Euchromatin
- c) Pseudochromatin
- d) None of above

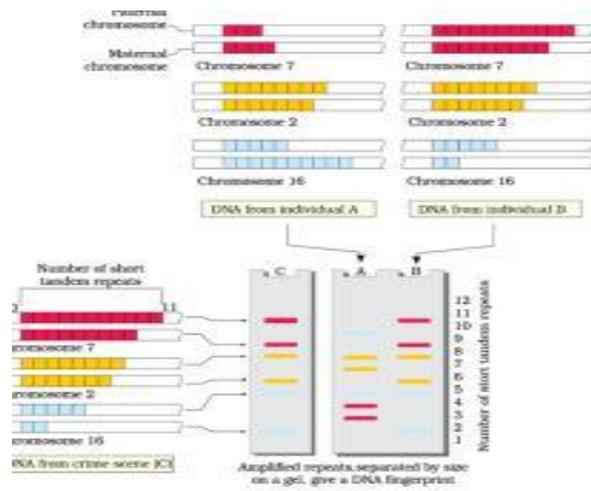
iv) Give the scientific term for Bead on string structure.

- a) Chromatin
- b) Nucleosome
- c) Linker DNA
- d) Histone

v) In which stage of cell division chromatin is modified in chromosomes and seen clearly.

- a) Prophase
- b) Metaphase
- c) Anaphase
- d) Telophase

4. Study the following crime case in which DNA finger print of two individual suspects A and B obtained from their DNA sample and DNA sample from the crime scene has the DNA fingerprint C to answer the following questions:



i) The technique to obtain separate bands of DNA fragments is

- a) PCR
- b) Gel electrophoresis
- c) DNA fingerprint
- d) Southern blotting.

ii) These short tandem repeats are present in

- a) Satellite DNA
- b) Any part of DNA
- c) Homologous DNA
- d) Single strand DNA

iii) This technique relies on which characteristics of DNA polymorphisms:

- a) they are variable
- b) they are inheritable
- c) they are different from individual to individual
- d) they are short DNA fragments

i) only a

ii) b, c and d

iii) b and c

iv) all of the above

iv) Is it right to compare the VNTR of chromosome no 16 of C with the chromosome no 7 of the suspects.

Yes/no

v) The red bands of chromosomes are obtained at:

a) anode pole of gel electrophoric plate.

b) cathode pole of gel electrophoric plate.

c) neutral pole of gel electrophoric plate.

d) any where of gel electrophoric plate.

5. Read following and give answers.

Genghis Khan, the fearsome Mongolian warrior of the 13th century, may have done more than rule the largest empire in the world; according to a recently published genetic study, he may have helped populate it too. An international group of geneticists studying Y chromosome genome data under HGP have found that nearly 8 percent of the men living in the region of the former Mongol empire carry y- chromosomes that are nearly identical. That translates to 0.5 percent of the male population in the world, or roughly 16 million descendants living today.

i) Identify the phenomena mentioned above.

a) Human genome project

b) Density gradient separation

c) Radioactive marking

d) Heavy Isotope marking

ii) Which chromosome has fewest genes.

a) 1st

b) X

c) Y

d) 3rd

iii) Which chromosome has most genes.

a) X

b) Y

c) 1st

d) 2nd

iv) major approaches involved in Methodologies of HGP

a) Expressed Sequence Tags (ESTs)

b) Sequence Annotation

c) Both a and b

d) None of above

v) Which is not a goal of HGP

a) Identify all the approximately 20,000-25,000 genes in human DNA

b) Determine the sequences of the 3 billion chemical base pairs that make up human DNA

c) Store this information in databases & Improve tools for data analysis

d) Inhibition of transfer related technologies to other sectors, such as industries

CASE STUDY /DIAGRAM BASED QUESTIONS ANSWER-KEY

	1	2	3	4	5
i	B	A	A	A	A
ii	C	A	B	A	C
iii	C	C	A	ii	C
iv	D	A	B	NO	C
v	C	C	B	B	D

1. RNA primer is formed over
 - a. 5' end of DNA template
 - b. 3' end of DNA template
 - c. 5' end of new DNA strand
 - d. 3' end of new DNA strand
2. The process by which mRNA is formed from DNA is called:
 - a. Transcription
 - b. Synthesis
 - c. Translation
 - d. Coding
3. In a DNA molecule, the sugars:
 - a. Bond covalently to phosphate groups
 - b. Bond covalently to nitrogenous bases
 - c. Bond to nitrogenous bases by hydrogen bonds
 - d. Bond to both phosphate groups and nitrogenous bases by covalent bonds.
4. Which of the following is required as inducer(s) for the expression of Lac Operon?
 - a. Glucose
 - b. Galactose
 - c. Lactose
 - d. Lactose and Galactose
5. Removal of introns and joining the exons in a defined order in a transcription unit is called.
 - a. Tailing
 - b. Splicing
 - c. Transformation
 - d. Capping

Assertion-Reason Type Questions

In the following questions a statement of Assertion(A) is followed by a statement of Reason(R).

- a. If both Assertion and Reason are true, and the Reason is the correct explanation of the Assertion.
 - b. If both Assertion and Reason are true, and the Reason is the not the correct explanation of the Assertion.
 - c. If Assertion is true statement but Reason is false.
 - d. If both Assertion and Reason are false statements.
1. Assertion: mRNA is short lived RNA.
Reason: Formation of mRNA from DNA is called transcription.
 2. Assertion: DNA is macromolecule of high molecular weight.
Reason: Amino acids are monomeric units of DNA.
 3. Assertion: DNA consists of two complementary polynucleotide chains.
Reason: In two polynucleotide chains, A pairs with T and G pairs with C.
 4. Assertion: Replication and transcription occur in the nucleus but translation occurs in the cytoplasm.
Reason: mRNA is transferred from the nucleus into cytoplasm where ribosome and amino acids are available for protein synthesis.
 5. Assertion: Lac Operon given by Jacob and Monod is repressible Operon.
Reason: The system of regulation in lac operon is always a negative control.

CASE STUDY

- A. Read the paragraph and answer the following questions (i) to (v).

Protein synthesis consists of two main events, **transcription** and **translation**.

Transcription

It is the copying of complementary messenger RNA strand on a DNA strand. The DNA strands unwind and one of the two strands forms mRNA. The complementary bases pairing is A-U and G-C and the message coded in DNA is transcribed on mRNA. Transcription requires a template: Ribonucleotide triphosphates (ATP, GTP, UTP, CTP) the enzyme RNA polymerase and divalent metallic ions. The sigma factor initiates transcription of mRNA on the DNA template and core enzymes continue transcription in the 5' → 3' direction and termination is brought by rho factor.

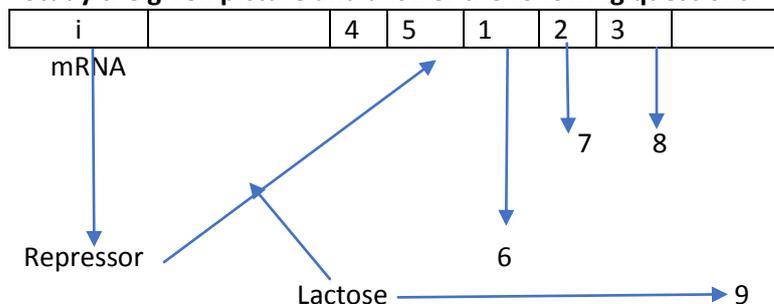
Translation

The formation of polypeptide chain at the site of ribosomes is described as translation. During this process, genetic information present in mRNA directs the order of specific amino acids to form a protein. The mRNA has a series of triplet bases, each triplet forming a codon. The codons pair with anticodon of tRNA molecule. The translation process consists of activation of amino acids, transfer of activated amino acid to tRNA, initiation of polypeptide chain synthesis, chain elongation and chain termination.

1. During translation, the first amino acid will almost always be brought by tRNA with an anticodon:
 - a. 5' ACA 3'
 - b. 3' AUA 5'
 - c. 3' UAC 5'

- d. 3' CUA 5'
2. Khorana discovered two codons with the help of nucleotide polymer:
 - a. Poly U
 - b. Copolymer UGUGUGUGUG
 - c. Poly C
 - d. Copolymer ACACACAC
 3. What will be the correct gene expression pathway?
 - a. Gene – mRNA – transcription – translation – protein
 - b. Transcription – gene – translation – mRNA – protein
 - c. Gene – transcription - mRNA - translation – protein
 - d. Gene – translation - mRNA - transcription – protein
 4. Formation of mRNA from DNA is called :
 - a. Translation
 - b. Transcription
 - c. Transformation
 - d. Transduction
 5. Assertion: One codon may code for more than one amino acid.
Reason: A codon is degenerated and ambiguous.
 - a. If both Assertion and Reason are true, and the Reason is the correct explanation of the Assertion.
 - b. If both Assertion and Reason are true, and the Reason is the not the correct explanation of the Assertion.
 - c. If Assertion is true statement but Reason is false.
 - d. If both Assertion and Reason are false statements.

B. Study the given picture and answer the following questions.



1. What does the given figure indicate?
 - a. Lac Operon
 - b. Translation
 - c. Blander Experiment
 - d. None of these
2. Name the product marked as (9)
 - a. Glucose
 - b. Galactose
 - c. Both (a) and (b)
 - d. None of these
3. Name the enzymes marked as (8)
 - a. Permease

- b. Transacetylase
 - c. Both (a) and (b)
 - d. None of these
4. Name the enzymes marked as (7)
- a. B-galactosidase
 - b. Permease
 - c. Transacetylase
 - d. None of these
5. Name the gene marked as (4)
- a. Promotor gene
 - b. Lac Z
 - c. Lac Y
 - d. None of these

ANSWER KEY

MCQ :	1. a	2. a	3.d	4.c	5.b
Assertion-Reason:	1.b	2.c	3.a	4.a	5.d
Case based:	A. 1.c	2.b	3.c	4. b	5.d
	B 1.a	2.c	3.b	4.b	5.a

STUDY 1-

Read the following and answer any four questions from (1) to (5) 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.

(1) 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

(2) 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

(3) 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.

4 The distance between two consecutive base pair in B DNA is

- A. 0.34 nm
- B. 3.4 nm
- C. 0.34 nm
- D. 34 nm

5 The types of nucleotides present in double helical structure of DNA are

- A. A ten types
- B. five types
- C. four types
- D. eight types

CASE STUDY -2

Read the following and answer any four questions from (1) to (5) given below:

The process of translation requires transfer of genetic information from a polymer of nucleotides to synthesise a polymer of amino acids. The relationship between the sequence of amino acids in a polypeptide and nucleotide sequence of DNA or mRNA is called genetic code. George Gamow suggested that in order to code for all the 20 amino acids, code should be made up of three nucleotides.

(1) What is a codon?

- (a) A length of DNA which codes for a particular protein
- (b) A part of the tRNA molecule to which a specific amino acid is attached.
- (c) A part of the tRNA molecule which recognises the triplet code on the messenger RNA.
- (d) A part of the messenger RNA molecule that has

a sequence of bases coding for an amino acid.

(2) Three consecutive bases in the DNA molecule provide the code for each amino acid in a protein molecule. What is the maximum number of different triplets that could occur ?

- a. 16
- b. 20
- c. 24
- d. 64

(3) Listed below are some amino acids and their corresponding mRNA triplets.

Amino acid	mRNA triplet
Phenylalanine	UUU
Lysine	AAG
Arginine	CGA
Alanine	GCA

Which DNA sequence would be needed to produce the following polypeptide sequence? Alanine-Arginine- Lysine- Phenylalanine

- a. CGT GCT TTC AAA
- b. CGT GCT TTC TTT
- c. CGU GCU UUC AAA
- d. CGU GCU UUC TTT

(4) Identify the non-sense codons among the following.

- a. AUG
- b. GUG
- c. UAA
- d. UGG

(5) A polypeptide is made using synthetic mRNA molecules as shown.

Synthetic mRNA used	Polypeptide produced
UUUAAAUUUAAA	Phenylalanine-lysine- phenylalanine-lysine

What are the DNA codes for the amino acids phenylalanine and lysine?

Phenylalanine Lysine

- A. (a) AAA TTT
- B. (b) AAA UUU
- C. (c) GGG CCC
- D. (d) TTT GGG

ANSWER KEY CASE STUDY

- 1 (b) Glycosidic bond
- 2 (a) James Watson and Francis Crick
- 3 (b) major and minor grooves
- 4 (a) 0.34nm
- 5 (c) four types.

CASE STUDY –2

- 1 (d) A part of the messenger RNA molecule that has a sequence of bases coding for an amino acid.
2. (d) 64
3. (a) CGT GCT TTC AAA
4. (c) UAA
5. (a) AAA TTT

ASSERTION AND REASON TYPE QUESTION

Directions: 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.

1 . Assertion: The two chains of DNA have anti-polarity.

Reason: In one chain of DNA, ribose sugar at 5' end consists of a free phosphate moiety while at the other end the ribose has a free 3' OH group.

2 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.

3 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.

4 Assertion : Histones are basic proteins of major importance in packaging of eukaryotic DNA. DNA and histones comprise chromatin forming the bulk of eukaryotic chromosome.

Reason : Histones are of five major types H1, H2A, H2B, H3 and H4.

5 . 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.

ANSWER KEY ASSERTION AND REASON TYPE

- 1 Answer: (a) The two chains of DNA have anti-parallel polarity this is because one chain has free phosphate moiety at 5'-end of the sugar and another chain has free phosphate moiety at 3'-end.
- 2 Answer: (a) In DNA, the code letters are A, T, G, and C, which stand for the chemicals adenine, thymine, guanine, and cytosine, respectively. In base pairing, adenine always pairs with thymine, and guanine always pairs with cytosine.
- 3 Answer: (c) Assertion is true but Reason is false.
- 4 Answer (a) both Assertion and Reason are true and Reason is the correct explanation of Assertion.
- 5 Answer: (d) When bacteria *Streptococcus pneumoniae* are grown on a culture plate, some produce smooth shiny colonies (S) while others produce rough colonies (R). This is because the S strain bacteria have a mucous (polysaccharide) coat, while R strain does not. Mice infected with the S strain (virulent) die from pneumonia infection but mice infected with the R strain do not develop pneumonia. In Griffith's experiment, some 'transforming principle', transferred from the heat-killed S strain, had enabled the R strain to synthesize a smooth polysaccharide coat and become virulent which must be due to the transfer of the genetic material. This is known as transformation.

MCQ TYPE QUESTION

- 1 Sickle cell anaemia is caused by change in
 - a. A single base
 - b. a chain of haemoglobin
 - c. Frame shift mutation
 - d. Whole β chain of haemoglobin
- 2 In DNA replication, the primer is
 - a. A small deoxyribonucleotide polymer
 - b. Small ribonucleotide polymer
 - c. Helix destabilising protein
 - d. Enzyme taking part in joining nucleotides to their complementary template bases.
- 3 In a given DNA segment ATC ACC AGG ACC CCA ACA, the first base gets mutated. The effect of this on coding by the DNA segment will result in :
 - a. One amino acid less in protein
 - b. No change in the sequence
 - c. Complete change in the type and sequence of amino acid
 - d. Change in first amino acid only
- 4 During Protein synthesis, at one point the process comes to a halt. Select the group of the three codons from the following, from which any one of the three could bring about this halt:

- a. UUC, UUA, UAC
- b. UAG, UGA, UAA
- c. UUE, UCA, UCG
- d. UUU, UCC, UAU

5 In prokaryotic translation, GTP molecule required in at:

- a. Formation of formyl-met-f-RNA
- b. Joining of 30S sub-unit of ribosome with n-RNA
- c. Joining of 30S m-RNA on Formyl-met-f-RNA
- d. Joining of 50S subunit of ribosome with initiation complex

ANSWER KEY MCQ

- 1 (a) A single base
- 2 (b) Small ribonucleotide polymer
- 3 (b) No change in the sequence
- 4 (b) UAG, UGA, UAA
- 5 (b) Joining of 30S sub-unit of ribosome with m-RNA

ASSERTION REASON TYPE QUESTIONSS

1. **Assertion :** In DNA replication, the strand with 5' → 3' polarity is discontinuously synthesized.

Reason: DNA dependent DNA polymerase carry out polymerization in only one direction.

2. **Assertion:** DNA fingerprinting is a technique to find out variations in individuals of a population at DNA level.

Reason: DNA fingerprinting was initially developed by Alec Jeffreys.

MCQ

1. A nitrogenous base is linked to the pentose sugar through a linkage.

- a) phosphodiester
- b) glycosidic
- c) phosphate
- d) phosphoester

2. The backbone of two polynucleotide chains of DNA is constituted by

- a) adenine and thymine
- b) purines and pyrimidines
- c) sugar and phosphate
- d) sugar and purines

3. is a codon that codes for methionine and also act as initiator codon.

- a) AUG
- b) UGG
- c) UGA
- d) UAG

4. The significance of coding strand in transcription is :

- a) it codes for amino acids.
- b) it is used as reference point while defining transcription unit.
- (c) both (a) and (b)
- (d) none of the above

5. In DNA a purine comes opposite to a pyrimidine this generates the:

- a) the semiconservative nature of DNA
- b) the antiparallel nature of DNA
- c) the uniform width throughout DNA
- d) none of the above

CASE BASED QUESTIONS

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

Regulation of transcription is a primary step for regulation of gene expression. In bacteria more than one gene is arranged together in units called as operons .*Lac operon* is the prototype operon in bacteria , which codes for genes responsible for metabolism of lactose. The operon is regulated by the amount of lactose in the medium where the bacteria are grown .

(i) Substrate for the enzymes produced by *Lac operon* is:

- a) Tryptophan
- b) Valine
- c) Histidine
- d) Lactose

ii) The scientists who elucidated the concept of Lac operon:

- a) Francis Jacob and Jacque Monod
- b) Francis Jacob and Har Gobind Khorana
- c) Matthew Meselson and Franklin Stahl
- d) Maurice Wilkins and Rosalind Franklin

iii) *Lac operon* is an example of gene regulation at:

- a) Translational level
- b) Transcriptional level
- c) Processing level
- d) None of the above

(iv) Which statement correctly describes the control of transcription of the genes involved in the breakdown of lactose in *Escherichia coli*?

- a) A repressor protein binds to the operator and the genes are switched on.
- b) A repressor protein binds to the operator and the genes are switched off.
- c) A repressor protein binds to promoter and the genes are switched on.
- d) A repressor protein binds to the promoter and the genes are switched off.

(v) In *Lac operon*, the enzyme responsible for the hydrolysis of the disaccharide into monomeric units is:

- a) transacetylase
- b) permease
- c) beta-galactosidase
- d) none of the above

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

During transcription, one of the strands of DNA act as a template to direct the synthesis of complementary RNA. RNA contains the base sequences that are read in a combination of three to code for an amino acid. The genetic code is read again on the principle of complementarity by tRNA that acts as adapter molecule .

i)The process of copying genetic information from one strand of DNA into RNA is called:

- a) Replication
- b) Transcription
- c) Translation
- d) Reverse transcription

ii) Genetic code :

- a) Is a relationship between sequence of DNA or mRNA to polypeptide
- b) Triplet bases on mRNA
- c) Determines the sequence of amino acid in polypeptide
- d) All of the above

iii) From the following , identify the correct combination of salient features of genetic code.

- a) Universal, non-ambiguous, overlapping
- b) Degenerate, overlapping, comma less
- c) Universal , ambiguous, degenerate
- d) Degenerate, universal, non-ambiguous

(iv) Which of the following statements are **incorrect**?

- i) RNA act as genetic material as well as catalyst
- ii) RNA is more stable than DNA.
- iii) RNA has evolved from DNA

- a) I) and iii) only
- b) ii) and iii) only
- C) i) , ii) and iii)
- d) i) and ii) only

v) The enzyme DNA dependent RNA polymerase catalyse the polymerization reaction in direction:

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

ANSWER KEY

1. Both assertion and reason are true and reason is the correct explanation of assertion.
2. Both assertion and reason are true and reason is not the correct explanation of assertion.

MCQ

1. (b) glycosidic
2. (c) sugar and phosphate
3. (a) AUG
4. b) it is used as reference point while defining transcription unit.
5. c) the uniform width throughout DNA

CASE BASED QUESTIONS

1. (i) **d)** Lactose
- (ii) **(a)** Francis Jacob and Jacque Monod
- (iii) b) Transcriptional level
- (iv) b) A repressor protein binds to the operator and the genes are switched off.

(v) c) beta-galactosidase

2. i) d) transcription

ii) d) All of the above

iii) d) Degenerate, universal, non-ambiguous

iv) b) ii) and iii) only

v) a) only 5'→3'

1. phenomenon occurring during prophase I of meiosis is _____.

a) Mutation

b) Synapsis

c) Translation

d) Crossing over

Ans: Synapsis

2. Which of the following statements is incorrect?

(a) It is easier to study the polygenic inheritance of character in the plant than animals

(b) Pseudoalleles are duplicate factors

(c) Gametes are never hybrid

(d) Rh factor is not controlled by multiple alleles

Ans (c)

3. How many different types of gametes can be formed by F1 progeny? resulting from the following cross AABBCc x aa bb cc?

(a) 3 (b) 8

(c) 7 (d) 64

Ans: (d)

4. Ovulation in the human female normally takes place during the menstrual cycle

a) at the mid secretory phase

(b) just before the end of the secretory phase

- (c) at the beginning of the proliferative phase
- (d) at the end of the proliferative phase.

Ans (d)

5. Morula is a developmental stage

- (a) between the zygote and blastocyst
- (b) between the blastocyst and gastrula
- (c) after the implantation
- (d) between implantation and parturition

Ans (a)

Assertion reason questions

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

1.Assertion :The hnRNA in humans has exons and introns.

Reason : The primary transcript produced in eukaryotes is translated without undergoing any modification or processing.

ans: (c)

2. Assertion: The cross between the F1 progeny and either of the parent types is a test cross.

Reason: The cross between F1 progeny and the double recessive genotype is back cross.

Ans (d)

3.Assertion: A good example of multiple alleles is ABO blood group system.

Reason: When IA and IB alleles are present together in ABO blood group system, they both express their own types.

Ans(b)

4.Assertion: On true breeding lines, Mendel conducted cross pollination experiments.

Reason: For several generations, true breed line have stable trait inheritance

Ans (a)

5. **Assertion:** Family planning is an action plan to attain reproductive health among people.

Reason: Improved programmes covering reproduction related areas were propagated by RCH to create awareness among people.

Ans: (B)

Read the following passage and answer the following according to your understanding of concepts.

1. Pollination is the transfer of pollen grains from the anther of one flower to the stigma of the same or another flower. It is said to be the first process of sexual reproduction in flowering plants. Pollen grains contain the male gamete and are present in the anthers of the flower. In self-pollinating plants, there is less dependence on the external factors to cause pollination. Self-pollination is said to reduce the vigor and vitality of the race as there are no new features introduced. But in cross pollination there is a high wastage of pollen grains that need to be produced to ensure fertilization occurs.

i) Pollination in Lotus is:

(a) By water (b) By wind (c) By insect (d) All of these

ii) Haploid plants develop by pollen are called

(a) Emasculation (b) Parthenocarpy (c) androgenesis (d) somatic hybridization

iii) Entomophily take place by

(a) By Bird (b) By Bat (c) By Wind (d) By Insect

iv) Assertion : Hydrophily constitutes a major mode of pollination in most of the aquatic angiospermous plants

. Reason: Almost all the aquatic dicot and monocot plants require water for the transport of male gametes and for fertilisation.

(a) Assertion and reason both are correct and reason is the correct explanation of assertion. (b) Assertion and reason both are correct but reason is not the correct explanation for assertion.

(c) Assertion is correct but reason is incorrect

(d) Assertion is incorrect but Reason is correct

2. Linkage and recombination are phenomena that describe the inheritance of genes. A linkage is a phenomenon where two or more linked genes are always inherited together in the same combination for more than two generations. The recombination frequency of the test cross progeny is always lower than 50%. Therefore, if any two genes are completely linked, their recombination frequency is almost 0%. The phenomenon of linkage was studied by the scientist T.H. Morgan using the common fruit fly or *Drosophila melanogaster*.

i) There are 4 pairs of chromosomes in a Drosophila. The linkage groups present in it are

- (a) one more than the pair of chromosomes
- (b) one less than the pair of chromosomes
- (c) four
- (d) eight

Ans (c)

ii) Percentage of crossing over is more when

- (a) genes are located in a different cell
- (b) genes are not linked
- (c) linked genes are located close to each other
- (d) linked genes are located far apart from each other

Ans (d)

iii) Alleles of different genes that are on the same chromosome can occasionally be separated by a phenomenon called

- (a) crossing over
- (b) continuous variation
- (c) epistasis
- (d) pleiotropy

Ans (a)

iv) If gene frequency between genes a and c is 2%; b and c is 13%; b and d 4%; a and b 15%; c and d 17 and a and d 19%. The sequence of genes in a chromosome is

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

Ans (d)

v) In a linear chromosome map distance between 4 loci is as follows a-b is 10%, a-d is 3%, b-c is 4% and a-c is 6%. The crossover frequency between c and d is

- (a) 4-12%
- (b) 3-6%
- (c) 9%
- (d) 3%

Ans (d)

1. Study column a and b enzyme and its function are given. select the incorrect pair from the given options.

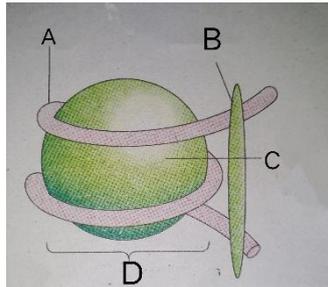
	Column a.	Column b
i.	DNA polymerase.	Addition of nucleotide
ii.	RNA polymerase.	Build mRNA molecule.
iii.	DNA ligase.	Unwinding of DNA.
iv.	Helicase.	Joining of segments.

- A. (i), (iv)
- B. (ii), (iii)
- C. (ii), (iv)**
- D. (i), (ii)

2. R N A Polymerase III is responsible for the transcription of which of the following.
 - A. Ribosomal RNA except 5s
 - B. mRNA
 - C. snRNA
 - D. tRNA ,5srRNA ,and some snRNAs**
3. If the anticodon for methionine is UAC in tRNA. Codon for same in coding strand of DNA transcription unit will be.

- A. TAC**

- B. ATG
C. ACG
D. TCA
4. Who were the first scientists to elucidate a transcriptionally regulated system (lac operon) in E.coli.
- A. Jacque Monod and Matthew Meselson
B. Franklin Stahl and Oswald Avery
C. Colin MacLeod and Maclyn McCarty
D. Francois Jacob and Jacque Monod
5. Observe the diagram given below. Select the correct option for A, B, and D.



- A. (A)DNA, (B)Histone Octamer, (C)H1 histone, (D)nucleosome
B. (A)DNA, (B)H1 histone, (C)Histone Octamer, (D)Nucleosome
C. (A)DNA, (B)H1 histone, (C)nucleosome, (D)Histone Octamer
D. (A)DNA, (B)Nucleosome, (C)Histone Octamer,(D)H1 protein.

Assertion and reason type questions.

Following are assertion and reason type question select the correct option As given below.

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

1. **Assertion** :- unequivocal proof of DNA as genetic material came from transduction experiment performed by Alferd hearts and Martha chase (1952)

Reason :- The used bacteriophage and bacteria for their experiment

Answer :- B

2. **Assertion** :- variations at genetic level is called as DNA polymorphism.

Reason :- DNA polymorphism can arise due to mutation.

Answer :- A

3. **Assertion** :- DNA is wrapped around the histone octamer to form a structure called nucleosome

Reason :- DNA acquires negative charge due to the presence of histone protein

Answer :- C

4. Assertion :- the sequence of chromosome 1 was completed only on May 2007.

Reason :- the number of gene present in chromosome is 2968.

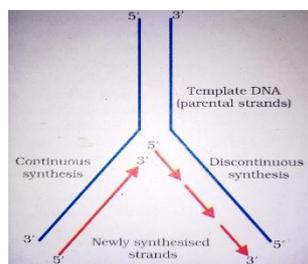
Answer :- D

5. **Assertion** :- Replication and transcription occur in nucleus but translation occur in cytoplasm.

Reason :- mRNA is transferred from nucleus into cytoplasm where ribosome and amino acid are available for protein synthesis.

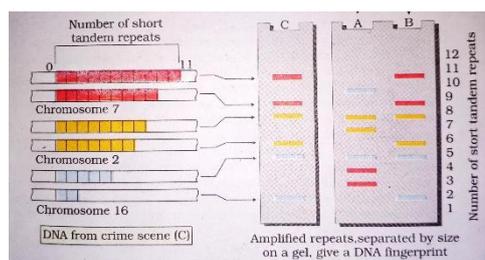
Assertion :- A

Case based question



Case 1:- observe the diagram given below and answer the following question

- In one of the template with polarity 5'—3' is discontinuous because.
 - Addition of nucleotide take place only at 3'-OH of sugar**
 - Addition of nucleotide take place only at 2'-OH of sugar
 - Addition of nucleotide take place only at 4'-OH of sugar
 - Addition of nucleotide take place only at 5'-OH of sugar
- The replication occur within a small opening of DNA helix referred to as.
 - Replication site.
 - replication cork.
 - Replication fork.**
 - none of the above.
- The scheme of DNA replication is termed as.
 - conservative mode of DNA replication.
 - non conservative mode of DNA replication.
 - non semi conservative mode of DNA replication.
 - semiconservative mode of replication.**



Case 2:- study the diagram given below and answer the question

1. The DNA from Crime Scene marked as C .obtained the DNA from Crime Scene matches with the individual .
 - A. Individual A
 - B. Individual B**
 - C. Individual A and B both
 - D. None of the above
2. The investigator were able to obtain DNA sample of suspect because
 - A. Hair must be there as DNA can be obtained only from it.
 - B. Skin tissue must be there as DNA can be obtained only from it.
 - C. Semen must be there as DNA can be obtained only from it.
 - D. They must have found any part of body as DNA can be extracted from any cell of body.**
3. The enzyme that is used during the above process is.
 - A. DNA polymerase
 - B. RNA polymerase
 - C. Restriction endonuclease**
 - D. None of the above

3 In a DNA strand the nucleotides are linked together by:

- (a) glycosidic bonds
- (b) phosphodiester bonds
- (c) peptide bonds
- (d) hydrogen bonds

4 A nucleoside differs from a nucleotide. It lacks the:

- (a) Base
- (b) sugar
- (c) phosphate group
- (d) hydroxyl group

The net electric charge on DNA and histones is:

- (a) both positive
- (b) both negative
- (c) negative and positive, respectively
- (d) zero

The first genetic material could be:

- (a) protein
- (b) carbohydrates
- (c) DNA
- (d) RNA

Which of the following steps in transcription is catalysed by RNA polymerase?

- (a) Initiation
- (b) Elongation
- (c) Termination
- (d) All of the above.

Control of gene expression takes place at the level of:

- (a) DNA-replication
- (b) Transcription
- (c) Translation
- (d) None of the above.

One of the following is true with respect to AUG.

- (a) It codes for methionine only
- (b) It is also an initiation codon
- (c) It codes for methionine in both prokaryotes and eukaryotes.
- (d) All of the above.
