Class-XII Session 2022-23
Subject - Biology (044)
Sample Question Paper - 21
With Solution

BLUE PRINT

Ch. No.	Title	Marks Per Unit	Section-A (1 marks)	Section-B (2 marks)	Section-C (3 marks)	Section-D (4 marks)	Section-E (5 marks)	Total Marks
			MCQ & A/R Ques. No.	VSA Ques. No.	SA Ques. No.	Case based Ques. No.	LA Ques. No.	
1	Reproduction in organisms	16	2(Q1, 2)					2
2	Sexual Reproduction in Flowering Plants		1(Q16)	2(Q18, 20)				5
3	Human Reproduction				1(Q28)	1(Q29)		7
4	Reproductive Health			1(Q17)				2
5	Principles of Inheritance and Variation	20	2(Q3, 7)	1(Q21)	1(Q23)		1(Q31)	12
6	Molecular Basis of Inheritance		2(Q4, 8)		1(Q22)			5
7	Evolution				1(Q26)			3
8	Human Health and Disease	12	1(Q15)				1(Q32)	6
9	Strategies for enhancement in food production		2(Q5, 6)		1(Q27)			5
10	Microbes in Human Welfare		1(Q13)					1
11	Biotechnology-Principles and Processes	12	2(Q9, 10)		1(Q25)			5
12	Biotechnology and its Application		1(Q14)	1(Q19)		1(Q30)		7
13	Organisms and Populations	10	1(Q12)					1
14	Ecosystem							0
15	Biodiversity and conservation				1(Q24)		1(Q33)	8
16	Environmental issues		1(Q11)					1
	Total Marks (Total Questions)		16(16)	10(5)	21(7)	8(2)	15(3)	70(33)

NOTE: The number given inside the bracket denotes question number, ask in the sample paper, while the number given outside the bracket are the number of questions from that particular chapter.

Time Allowed : 3 Hours **Max. Marks : 70**

General Instructions

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section–C has 7 questions of 3 marks each: Section–D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
4. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

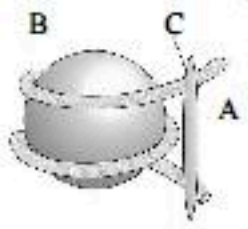
SECTION-A

1. Which of the following statements regarding the asexual reproduction is incorrect?
- (a) Both mitotic and meiotic division occurs.
- (b) It does not contribute to evolution and speciation.
- (c) It is uniparental and usually occurs in unicellular organisms.
- (d) There is no variation and the offsprings have the same phenotype and genotype.

2. The site of origin of the new plantlets in potato, dahlia, ginger and banana is
- (a) floral buds present on stem.
- (b) internodes of modified stem.
- (c) nodes of modified stem.
- (d) adventitious buds present on root.

3. ABO blood group system is due to
- (a) multifactor inheritance
- (b) incomplete dominance
- (c) multiple allelism
- (d) epistasis

4. Refer the given figure of nucleosome and select the option that correctly identifies the parts A, B and C.



	A	B	C
(a)	DNA	Histone octamer	H1 histone
(b)	Histone octamer	H1 histone	DNA
(c)	Histone octamer	DNA	H1 histone
(d)	DNA	H1 histone	Octamer

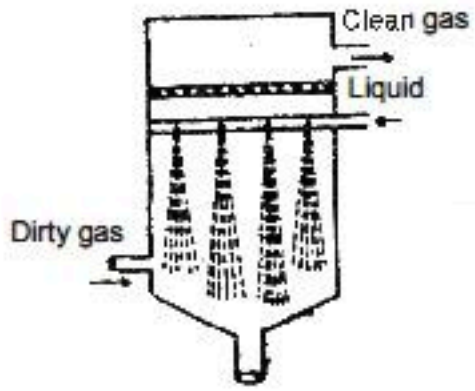
5. Inbreeding depression
- (a) usually increases fertility only.
- (b) usually reduces productivity only.
- (c) usually reduces fertility and productivity.
- (d) usually increases fertility and productivity.

6. The 'mule' is the result of
- (a) inbreeding depression
- (b) out-breeding
- (c) cross-breeding
- (d) inter-specific hybridization

7. Which of the following is incorrect regarding ZW-ZZ type of sex determination?
- (a) It occcurs in birds and some reptiles
- (b) Females are homogametic and males are heterogametic
- (c) 1 : 1 sex ratio is produced in the offsprings
- (d) All of these

8. DNA replication is
- (a) conservative and discontinuous
- (b) semiconservative and semi discontinuous
- (c) semiconservative and discontinuous
- (d) conservative

9. Plasmid has been used as vector because
   (a) both its ends show replication.
   (b) it can move between prokaryotic and eukaryotic cells.
   (c) It transfer the piece of DNA attached to it.
   (d) it has antibiotic resistance gene.
10. The linking of antibiotic resistance gene with the plasmid vector became possible with
   (a) DNA ligase
   (b) endonucleases
   (c) DNA polymerase
   (d) exonucleases
11. According to size of air pollutants, range and types of chemical the device given below is best used to control which of the following pollutants?



   (a) large particulates
   (b) charged particulate matter
   (c) Dissolved gases
   (d) fine particles
12. The kangaroo rats of North American deserts do not need to drink water because
   (a) they meet their water requirement through internal fat oxidation when the water is a byproduct.
   (b) they are able to concentrate urine, to minimize water loss.
   (c) they do not have sweat glands.
   (d) all of the above

Directions: Q.No. 13–16: 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.

---

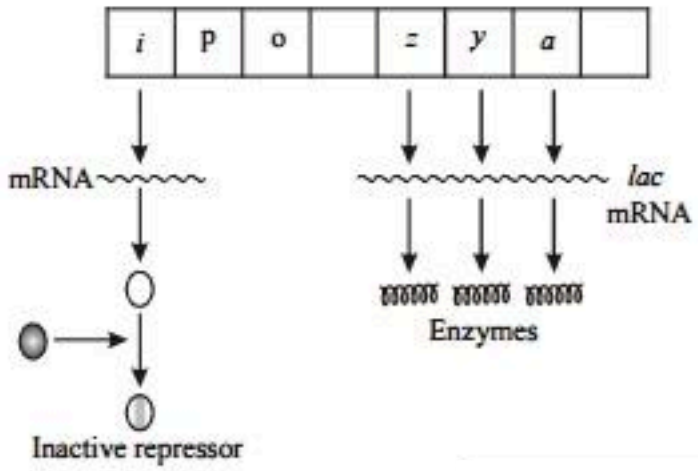
13. **Assertion:** Curdling is required in the manufacture of cheese.
    Reason: Lactic acid bacteria are used for the purpose.
14. **Assertion:** Insulin is said to be anabolic hormone.
    Reason: Failure of insulin secretion causes diabetes.
15. **Assertion:** Female mosquito is an example of temporary parasite.
    Reason: Plasmodium is an endoparasite.
16. **Assertion:** Insects visit flowers to gather honey.
    Reason: Attraction to flowers prevents the insects from damaging other parts of the plant.

SECTION-B

17. Write about the importance of family planning programme in India ?
18. Why are angiosperm anthers called dithecous? Describe the structure of microsporangium and draw a well labelled diagram.
19. What is meant by transgenic animal? List any four areas in which transgenic animals have wide applications.
20. Make a list of any three outbreeding devices that flowering plants have developed and explain how they help to encourage cross-pollination.
21. Sex determination is based on particular chromosomes in both birds and humans. State two points of difference between their mechanisms of sex determination.

SECTION-C

22. Study the figure given below and answer the questions.



(a) What does the figure express?
(b) When does the transcription of *lac* mRNA stop?
(c) Name the enzymes transcribed by the genes '*z*' and '*a*'.

OR

(a) Name the scientist who suggested that the genetic code should be made of a combination of three nucleotides. Explain the basis on which he arrived at this conclusion.
(b) Name two salient features of genetic code.

23. Name a disorder, give the karyotype and write the symptoms where a human male suffers as a result of an additional X-chromosome.

24. "Stability of a community depends on its species richness." Write how did David Tilman show this experimentally.

25. (a) A mixture of fragmented DNA was electrophoresed in an agarose gel. After staining the gel with ethidium bromide, no DNA bands were observed. What could be the reason?
(b) Do eukaryotic cells have restriction endonucleases? Justify your answer.

26. Explain adaptive radiation and convergent evolution by taking example of some of Australian marsupials and Australian placental mammals.

OR

Australian Marsupials and placental mammals are suitable examples of adaptive radiation and convergent evolution. Explain giving reasons.

27. (i) Write the scientific name of most common species of honeybee reared.
(ii) Mention the kind of areas that are suitable for bee keeping practices.
(iii) Mention any two uses of bee-wax.

28. (i) Explain the events taking place at the time of fertilisation of an ovum in a human female.
(ii) Trace the development of the zygote up to its implantation in the uterus.
(iii) Name and draw a labelled sectional view of the embryonic stage that gets implanted.

SECTION-D

29. Read the following and answer any four questions from 29(i) to 29(iv) given below:

Events of Menstrual Cycle:

The major events of the menstrual cycle are as follows as the cycle starts with the menstrual phase, when menstrual flow occurs and it lasts for 3-5 days. The menstrual flow results due to breakdown of endometrial lining of the uterus and its blood vessels which forms liquid that comes out through vagina. Menstruation only occurs if the released ouvm is not fertilised. Lack of menstruation may be indicative of pregnancy. However, it may also be caused due to some other underlying causes like stress, poor health etc. The menstrual phase is followed by the follicular phase.

During this phase, the primary follicles in the ovary grow to become a fully mature Graafian follicle and simultaneously the endometrium of uterus regenerates through proliferation. These changes in the ovary and the uterus are induced by changes

in the levels of pituitary and ovarian hormones. The secretion of gonadotropins (LH and FSH) increases gradually during the follicular phase, and stimulates follicular development as well as secretion of estrogens by the growing follicles. Both LH and FSH attain a peak level in the middle of cycle (about 14th day). Rapid secretion of LH leading to its maximum level during the mid-cycle called LH surge induces rupture of Graafian follicle and thereby the release of ovum (ovulation). The ovulation (ovulatory phase) is followed by the luteal phase during which the remaining parts of the Graafian follicle transform as the corpus luteum.

The corpus luteum secretes large amounts of progesterone which is essential for maintenance of the endometrium. Such an endometrium is necessary for implantation of the fertilised ovum and other events of pregnancy. During pregnanacy, all events of the menstrual cycle stop and there is no menstruation. In the absence of fertilisation, the corpus luteum degenerates. This causes disintegration of the endometrium leading to menstruation, marking a new cycle. In human beings, menstrual cycles cease around 50 years of age; that is termed as menopause. Cyclic menstruation is an indicator of normal reproductive phase and extends between menarche and menopause.

(i) What causes menstrual flow?
(ii) Why secretory phase is also known as luteal phase?
(iii) What happen if LH secreted rapidly?
(iv) Which of the hormone has no role in menstruation?

30. Read the following and answer any four questions from 30(i) to 30(iv) given below:

Bt Cotton:

Some strains of Bacillus thuringiensis produce proteins that kill certain insects such as lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes). *B. thuringiensis* forms protein crystals during a particular phase of their growth. These crystals contain a toxic insecticidal protein. Why does this toxin not kill the Bacillus. Actually, the *Bt* toxin protein exist as inactive protoxins but once an insect ingest the inactive toxin, it is converted into an active form of toxin due to the alkaline pH of the gut which solubilise the crystals. The activated toxin binds to the surface of midgut epithelial cells and creates pores that cause cell swelling and lysis and eventually cause death of the insect. Specific *Bt* toxin genes were isolated from *Bacillus thuringiensis* and incorporated into the several crop plants such as cotton (Figure 12.1). The choice of genes depends upon the crop and the targeted pest, as most *Bt* toxins are insect-group specific. The toxin is coded by a gene named cry. There are a number of them, for example, the proteins encoded by the genes crylAc and crylIAb control the cotton bollworms that of crylAb control corn borer.

(i) What is role of cry II *Ab* and cry I *Ab*?
(ii) Specific *Bt* toxin gene was isolated from which organism?
(iii) Name the gene that encodes for *Bt* protein specific to cotton bollworm?
(iv) Consider the following statements (A-D) about organic farming
  (A) utilizes genetically modified crops like Bt cotton
  (B) uses only naturally produced inputs like compost
  (C) does not use pesticides and urea
  (D) produces vegetables rich in vitamins and minerals.

  Which of the above statements are correct?

  (a) B, C and D (b) C and D only
  (c) B and C only (d) A and B only

SECTION-E

31. Mr. Oberoi angrily says to his daughter not to marry Mohan since their family is known to inherit haemophilia. The daughter objected to her father's order. Mr. Oberoi was adamant and threatened also. Brijmohan's daughter explained the biological interpretation of his fear and convinced her father.

(a) Briefly discuss the inheritance pattern of haemophilia.
(b) Mohan was not haemophilic though his father is haemophilic. Explain the condition of Mohan by considering following three conditions of his mother:
  (i) Normal mother
  (ii) Carrier mother
  (iii) Haemophilic mother
(c) Is there any fear of haemophilia if Mr. Oberoi daughter marries Mohan (non-haemophilic)?

OR

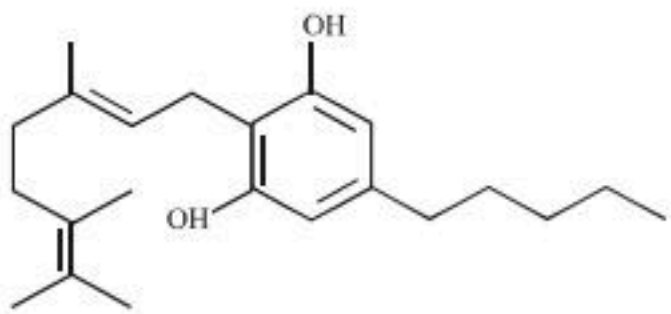
How Hershey and Chase proved that DNA is the genetic material?

32. Briefly explain the lifecycle of *plasmodium*. What measures would you take to control malaria?

OR

(a) What measures do you suggest for prevention and control of alcohol and drug abuse among adolescents?

(b) The outline structure of a drug is given below.



(i) Which group of drugs does this represent? Name the plant from which it is obtained.

(ii) What are the modes of consumption of these drugs?

(iii) Name the organ of the body which is affected by consumption of these drugs.

33. Mention the factors which cause changes in the size of population of a species.

OR

(a) State how *ex-situ* conservation helps in protecting biodiversity. Name four types of *ex-situ* methods.

(b) Explain the importance of sacred groves.

Solutions

SAMPLE PAPER-2

1. **(a)** When offspring is produced by a single parent with or without the involvement of gamete formation, the reproduction is called asexual. As a result, the offspring that are produced are not only similar to one another but are also exact copies of their parent. Only mitotic division occurs in asexual reproduction. (1 mark)
2. **(c)** (1 mark)
3. **(c)** The mode of inheritance in case of multiple alleles is called multiple allelism. A well known and simplest example of multiple allelism is the inheritance of ABO blood groups in human beings. In human population, 3 different alleles for this characters are found – IA, IB and IO. A person is having only two of these three alleles and blood type can be determined. (1 mark)
4. **(a)** (1 mark)
5. **(c)** Inbreeding increases homozyosity. It involves the mating of movie closely related individuals within the same breed for 4-6 generations. (1 mark)
6. **(d)** The mule is a hybrid between male donkey and female horse. It is the result of interspecific hybridization in which crossing is done between the members of different species. Mules show hybrid vigour. They are sturdier than the horse and larger than donkeys. Both male and female mules are infertile. (1 mark)
7. **(b)** (1 mark)
8. **(c)** In semi conservative replication of DNA in each replica one half is the old strand and the other half is a new strand synthesised over it. Also, one strand is synthesised continuously and other discontinuously, hence called discontinuous. (1 mark)
9. **(c)** Plasmids is a genetic structure in a cell that can replicate independently of the chromosomes. It is typically a small circular DNA strand in the cytoplasm of a bacterium or protozoan. Plasmids are much used in the laboratory manipulation of genes. (1 mark)
10. **(a)** The linking of antibiotic resistance gene with the plasmid vector became possible with DNA ligase. DNA ligase is an enzyme that is able to join together two cut portions of DNA and therefore plays an important role in DNA repair. DNA ligase is also used in recombinant DNA technology as it ensures that the foreign DNA is bound to the plasmid into which it is incorporated. (1 mark)
11. **(c)** The given diagram in question shows a device known as scrubber that can remove gases like sulphur dioxide. In a scrubber, the exhaust is passed through a spray of water or lime. (1 mark)
12. **(d)** The Kangaroo rats of North American deserts do not need to drink water because of the following reasons, like- they meet their water requirements through internal oxidation fats when water is a byproduct, they are able to concentrate their urine thereby minimizing the loss of water from their body and also they do not have sweat glands so no perspiration occurs in the animals. (1 mark)
13. **(b)** The manufacture of cheese requires two main steps: curdling and the ripening. Curdling the milk proteins forms a solid material from which the liquid is drained away. The curdling process is microbiological, since acid production of lactic acid bacteria is sufficient to coagulate milk proteins. (1 mark)
14. **(b)** Anabolic hormones are those which help in the formation of muscles, cellular growth and development and an overall increase in size. Insulin, growth hormone, testosterone are known as human anabolic hormones.
    Insulin results in the transport of glucose into the cell of the body. When insulin fails to do so there is an increase in the amount of glucose in the bloodstream and this will result in diabetes. (1 mark)
15. **(a)** (1 mark)
16. **(c)** Insect pollinated flowers are large, conspicuous, bright coloured and have pleasant smell. They have nectarines on receptacles or on spurs at the base of flower whorls and produce nectar. Nectar is a sweet substance that attracts insects towards the flowers. The rough and sticky pollens are stuck on the bodies of visiting insects and are transferred to sticky stigma of other flower. Attraction of insects towards flowers facilitates cross pollination. This makes Reason an incorrect statement. Insects visit flowers for nectar only honeybee forms honey out of nectar. This makes Assertion incorrect. (1 mark)
17. Our nation was the first nation in the world to initiate various action plans at national level towards attaining healthy society. (2 marks)
18. • The anthers of androecium of angiospermic flowers are bilobed and each lobe is divided into two parts or theca. Thus, the anther of angiosperms are dithecous.
    • Structure of microsporangium
    A typical microsporangium is surrounded by four wall layers, *i.e.*, epidermis, endothecium, middle layers and the tapetum. Outer three layers are protective in function and help in dehiscene of anther. Tapetum nourishes the developing microspores. (1 + 1 marks)

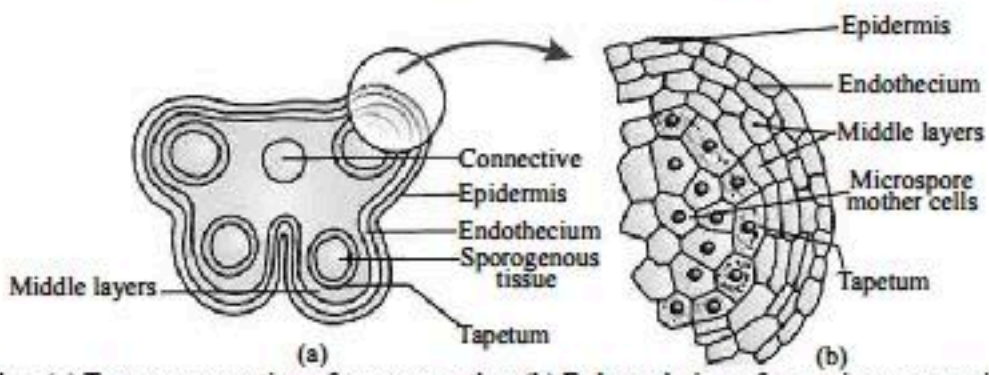


Fig.: (a) Transverse section of a young anther (b) Enlarged view of one microsporangium (2 marks)

19. The term transgenic animal refers to an animal carrying foreign genes. Foreign DNA is introduced into the animal, using recombinant DNA technology. The potential of the technology has also made it possible to consider employing cattle, sheep and goats as processing units to manufacture proteins or as organ donors.

Applications :

(i) In medical research, transgenic animals are used to identify the functions of specific factors in complex homeostatic system through over- or under-expression of a modified gene (the inserted transgene).

(ii) In the pharmaceutical industry, targeted production ol pharmaceutical proteins, drug production and product efficacy testing.

(iii) Developing animals specially created for use xenografting. (1+½+½ Marks)

20. Three outbreeding devices discussed that help to encourage cross-pollination are as follows-

(i) Pollen release and stigma receptivity are not synchronised.

(ii) Self-incompatibility, is a genetic phenomenon of preventing growth of pollen tube on the stigma of the same flower.

(iii) Production of unisexual flowers, *i.e.*, autogamy is prevented. (2 marks)

21. Sex determination in organisms is based on the type of sex chromosomes. Two main differences between them are –

(i) Sex determination in humans is XY type while those in birds is ZW type.

(ii) In human XY is male, XX is female while in birds ZZ is male, ZW is female. (2 marks)

22. (a) The given figure shows *lac* operon. This operon includes inducer (*i*), promoter (*p*), operator (*o*), and three structural genes (*z*, *y*, *a*). In presence of an inducer (such as lactose or allolactose), the repressor is inactivated on interaction with the inducer.

(b) During transcription of *lac* mRNA, the repressor of the operon is synthesised from the *i* gene. This repressor protein binds to the operator region of the operon and stops transcription.

(c) The gene '*z*' codes for beta-galactosidase enzyme and gene '*a*' codes for transacetylase enzyme. (1 + 1 + 1 Marks)

OR

(a) George Gamow suggested that the genetic code should be made up of a combination of three nucleotides.

He proposed that if 20 amino acids are to be coded by 4 bases, then the code should be made up of three nucleotides *i.e.*, $4^3 = 64$ ($4^2 = 16$), which is less than 20. So, the codon was proposed to be triplet.

(b) The salient features of genetic codes are as follows

(i) Genetic codes are universal.

(ii) Genetic codes are unambiguous.

(iii) The code is degenerate: The occurrence of more than one codon for a single amino acid is referred to as degenerate.

(iv) The code is non-overlapping.

(v) The code is comma less. (1 + 2 Marks)

23. It is chromosomal disorder called Klinefelter's syndrome, which occurs in males. Human males have XXY sex-chromosome (47 chromosomes) instead of XY.

Symptoms

(i) Sex of the individual is masculine but possess feminine characters.

(ii) Gynaecomastia, *i.e.*, development of breasts.

(iii) Poor beard growth and often sterile.

(iv) Feminine pitched voice. (1 + 4 × ½ Marks)

24. Species richness refers to the number of different species present per unit area.

Ecosystems with higher biodiversity (*e.g.* tropic forests) are more productive than with lower biodiversity (temperate forest). **David Tilman** found that plots with more species showed less year to year variation in total biomass. He also showed that increased diversity contributed to higher productivity. (3 marks)

25. (a) DNA bands may not be observed when a mixture of fragmented DNA was electrophoresed, due to following reasons-

(i) Concentration of agarose in the gel was not proper, as greater the concentration of agarose gel, greater will be the facilitation of the separation of small DNA fragments, whereas smaller the concentration of agarose higher will be the resolution of bands.

(ii) If the concentration of salt in the buffer was not proper.

(iii) If DNA sample is contaminated with RNA or any other impurity or if the concentration of DNA is very less.

(b) • No, eukaryotic cells do not have restriction en donucleases.

• This is because the DNA of eukaryotes is highly methylated by a modified enzyme, called methylase. Methylation protects the DNA from the activity of restriction enzymes. These enzymes are present in prokaryotic cells where they help to prevent the invasion of DNA by virus. (3 × ½ + 1½ Marks)

26. The process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (habitat) is called adaptive radiation. Australian marsupials are a good example.

Many Australian marsupials, each different from the other, e.g., kangaroo, sugar glider, etc., evolved from a common ancestral stock, but all within the Australian island continent.

When more than one adaptive radiation occur in an isolated geographical area, it can be called as convergent evolution. Australian placental mammals also show adaptive radiation in evolving into varieties of such placentral mammals, each one of which appear similar to a corresponding marsupial, *e.g.*, placental wolf and Tasmanian wolf, anteater and numbat, etc. (3 Marks)

27. (i) *Apis indica*

(ii) It can be practiced in any area, where there are sufficient bee pastures of some wild shrubs, fruit orchards and cultivated crops.

(iii) Beeswax is used in the preparation of cosmetics and polishes of various kinds. (1 + 1 + 1 Marks)

28. (i) (a) Fertilisation occurs in human beings in ampullary-isthmic junction of the Fallopian tube.

(b) A sperm contacts with zona pellucida layer of the ovum. It induces changes in the membrane that blocks the entry of additional sperms.

(c) Acrosome in head part of sperms helps to digest the zona pellucida and plasma membrane of the ovum (secondary oocyte) and enter into the cytoplasm.

(d) Entry of sperm induces the completion of second meiotic division of the secondary oocyte. It leads to the formation of a second polar body and a large ootid.

(e) Nucleus of the sperm and that of ootid fuses to form a diploid zygote.

(ii) Development of zygote up to implantation

(a) Cleavage division (mitotic) starts in zygote as it moves through the isthmus of fallopian tube towards the uterus.

(b) This division results into 2, 4, 8 and 16 daughter cells called blastomeres.

(c) The embryo with 8-16 blastomeres is called morula.

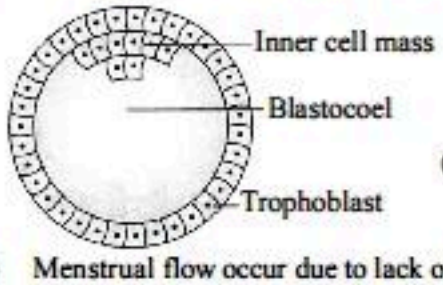
(d) Morula continues to divide and transforms into blastocyst as it moves further into uterus.

(e) Blastomeres in the blastocyst are arranged into an outer layer called trophoblast and inner group of cells attached to trophoblast called inner cell mass.

(f) Trophoblast layer then gets attached to the endometrium and the inner cell mass gets differentiated as the embryo.

(g) After attachment the uterine cells divide rapidly and cover the blastocyst. It leads to blastocyst's embedding in the endometrium of the uterus. This is called implantation.

(iii) Blastocyst stage implants in the uterus.



(1 + 1 + 1 Marks)

29. (i) Menstrual flow occur due to lack of Progesterone.

(ii) Secretory phase is also called luteal phase because during this phase remained part of graafian follicle transform as the corpus luteum.

(iii) Rapid secretion of LH (Luteinizing Hormone) leading to its maximum level during the mid-cycle called LH surge induces rupture of graafian follicle and there by the release of ovum.

(iv) TSH (Thyroid stimulating Hormones) has no role in menstruation. (1 + 1 + 1 + 1 Marks)

30. (i) Cry II Ab and Cry IAb produce toxins that control cotton bollworms and corn borer respectively.

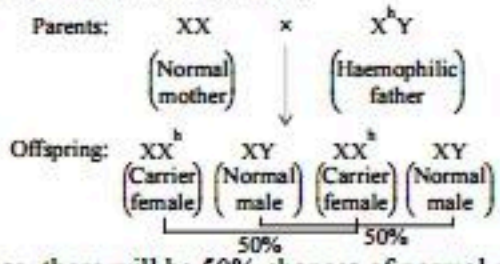
(ii) Specific *Bt* toxin gene were isolated from *Bacillus thuringiensis*

(iii) The gene that encodes for Bt protein specific to cotton bollworm is cry II Ab.

(iv) (c) (1 + 1 + 1 + 1 Marks)

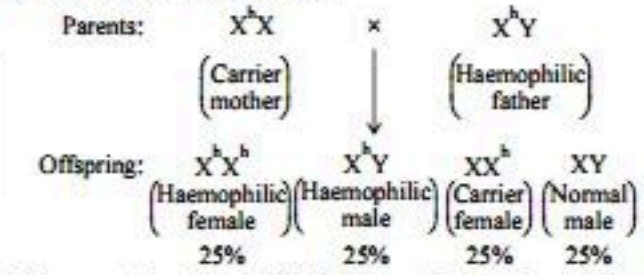
31. (a) Haemophilia is a genetic disorder that impairs the body's ability to make blood clots, a process needed to stop bleeding. It is usually inherited with an X-linked recessive inheritance pattern.

(b) (i) In case of normal mother,



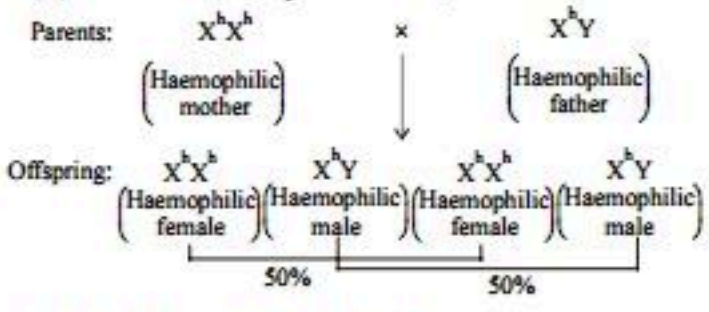
In this case, there will be 50% chances of normal male. This shows, Mohan will not be haemophilic if his mother is normal female while his father is haemophilic male.

(ii) In case of carrier mother,



In this case, there is only 25% chance that Mohan will not be haemophilic.

(iii) In case of haemophilic mother,



In this case Mohan will be diseased.

We can conclude that in case (i) and (ii), Mohan will be normal.

(c) No, there remains no fear if they married, as the girl's not a carrier of haemophilia. If the girl is a carrier, then the chance for the son to be haemophilic is 50%.

(1 + 3 + 1 Marks)

OR

- In 1952, Alfred Hershey and Martha Chase conducted a series of experiments on bacteriophage to prove that DNA is a genetic material. They did two experiments to prove that DNA is the carrier of the genetic information.

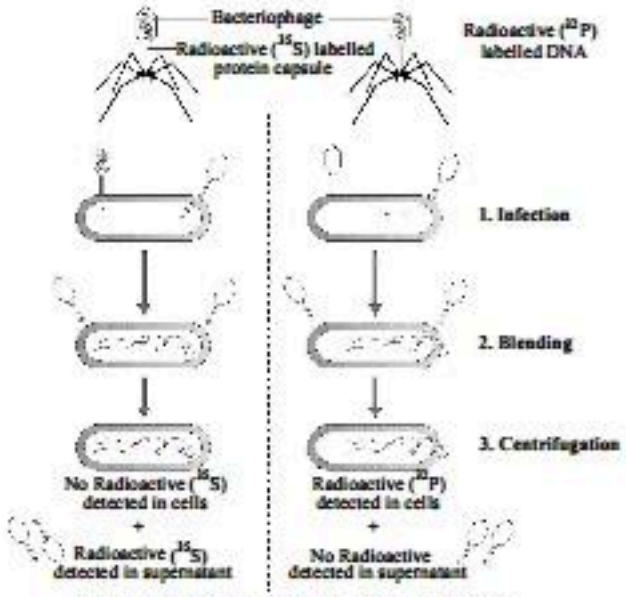


Fig.: Hershey and Chase Experiment

- **Procedure**

(i) Some bacteriophage virus were grown on a medium that contained radioactive phosphorus (^{32}P) and some in another medium with radioactive sulphur (^{35}S).

(ii) Virus grown in the presence of radioactive phosphorus (^{32}P) contained radioactive DNA.

(iii) Similar viruses grown in presence of radioactive sulphur (^{35}S) contained radioactive protein.

(iv) Both radioactive virus types were allowed to infect *E.coli* separately.

(v) Soon after injection, the bacterial cells were gently agitated in blender to remove viral coats from the bacteria.

(vi) The culture was also centrifuged to separate the viral particle from the bacterial cell.

- **Observation and conclusion:** Only radioactive ^{32}P was found to be associated with the bacterial cell, whereas radioactive ^{35}S was only found in surrounding medium and not in bacterial cell. This indicates that only DNA and not protein coat entered in bacterial cell. It proves that DNA is a genetic material, which passes from virus to bacteria.

(3 + 2 Marks)

32. *Plasmodium* (malarial parasite) enters the body as sporozoite through the bite of infected female *Anopheles* mosquito. Sporozoite multiply in liver cells and then attack RBCs resulting in their rupture. The ruptured RBCs release a toxin called haemozoin, which is responsible for the chill and high recurring fever every three to four days. When a female *Anopheles* mosquito bites an infected person, these parasites enter into the mosquitoe's body and undergo further development. The parasites multiply to form sporozoites that are stored in their salivary glands. When these mosquitoes bite a human, the sporozoites are introduced into his/her body. Thus, malarial parasite requires two hosts-man and mosquito to complete lifecycle. Following are the measures to control malaria —

(i) Screen all habitations from mosquitoes with wire-gause over doors, windows and ventilators

(ii) Avoiding stagnation of water is and around residential areas.

(iii) Use of mosquito nets and insect repellents.

(iv) Introduction of fishes like *Gambusia* in ponds, which feed on mosquito larvae.

(v) Spraying of insecticides such as DDT and BHC is ditches, drains and swamps. (2½ + 5 × ½ Marks)

OR

(a) Some of the important measures for the prevention and control of alcohol and drug abuse among adolescents are as follows -

(i) Drug education and counselling programme : It is important to provide drug education beginning with prospective drug users, essentially childrens and teens. Educate young people about the dangers associated with drug use and abuse.

(ii) Seeking helps from parents and peers : Parents need to be responsible and aware of what their children do and where they are at all time. They should spent more time with them in order to educate them properly and have better relationships with their children. Drug prevention enforcement should begins at home and should continue in school and after school.

(b) (i) Cannabinoids, *Cannabis sativa*

(ii) The mode of consumption is inhalation or oral ingestion.

(iii) Organs affected are heart and cardiovascular system. Such drugs cause illusions delusions (halluciations) and change the feelings or perception. (2 + 3 Marks)

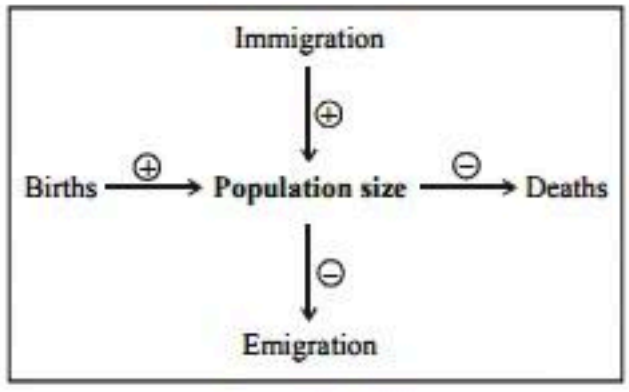
33. There are usually four factors which are actually involved in causing the changes in population size. These are births, deaths, immigration and emigration. Out of which, the births and immigration increases the size of the population of a species in a favourable habitat, whereas, deaths and emigration lower down the size of population in a less favourable habitat.

Natality (Birth rate) : If refers to the number of births during a given period of time in the population that are added to the initial density.

Mortality (Death rate) : Mortality is the number of deaths in a population during a given period.

Immigration : It is the number of individuals of the same species that have come into the habitat from elsewhere during the time period under consideration.

Emigration : Emigration is the number of individuals of the population who left the habitat and gone elsewhere during the time period under consideration.



The change in the size of population can be represented by the following equation –

$$N_t = N_o + [(B + I) - (D + E)]$$

Where, N_t = Net population size
N_o = Size of the population at the beginning
B = Birth rate or Natality
I = Immigration rate
D = Death rate or Mortality
E = Emigration rate (1 + 1 + 1 + 2 Marks)

OR

(a)
- *Ex situ* conservation is the method of preserving components of biological diversity outside their natural habitats. These will play an important role in recovery programmes for endangered species. Considering the rate of habitat loss worldwise, *ex situ* conservation is becoming increasingly important as compare to *in situ* conservation.
- Four types of advanced *ex situ* methods are as follow:

(i) Cryopreservation technique
(ii) Zoological parks
(iii) Botanical gardens
(iv) Seed banks

(b)
- The sacred groves are the areas that are protected due to some religious or cultural beliefs. These are important as these are the last refuges for a large number of rare and threatened plants. Such groves are found in Khasi and Jaintia hills in Meghalayas, Aravalli hills of Rajasthan, Western Ghats regions of Karnataka and Maharashtra.
- They are the repositories of rich medicinal plants, wild relatives of crops and many important species, which act as the valuable gene pool. They give much ecological and genetically significance and play an important role in wildlife conservation also. (3 + 2 Marks)