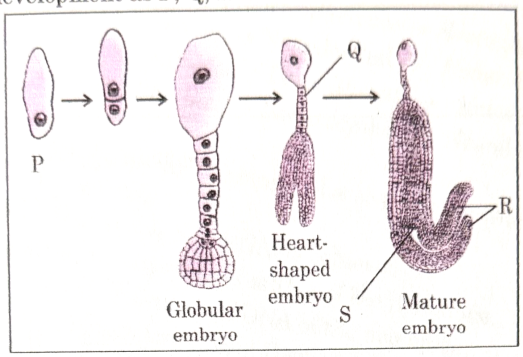
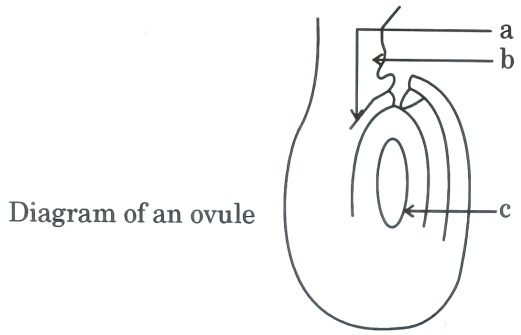
CHAPTER WISE QUESTION BANK

Class -XII, Subject :Biology (044)

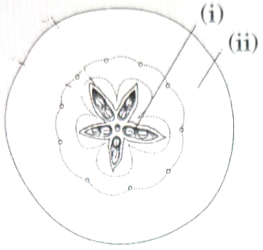
LESSON:-1 SEXUAL REPRODUCTION IN FLOWERING PLANTS

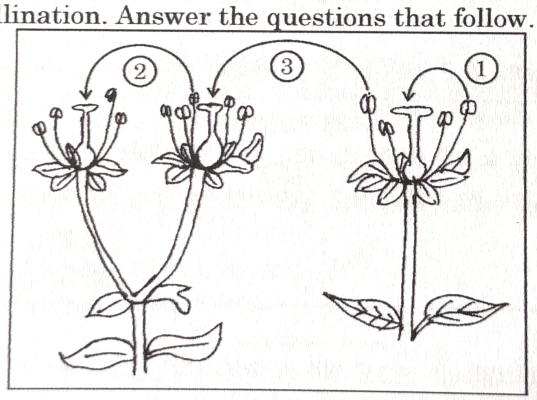
Q. N.	SECTION -(A) CARRY 1 MARK EACH	CBSE 2025
1.	Microspores are formed by : (A) Meiosis of pollen mother cell (B) Mitosis of polar nuclei (C) Mitosis of pollen mother cell (D) Meiosis of tapetal cells **Appropriate option:**(A)/ Meiosis of pollen mother cell	*(Delhi)For Visually Impaired*
2.	*Assertion (A) :* Pollen grains are well preserved as fossils. *Reason (R) :* Fossils are formed only from bones and teeth of animals. **Appropriate option:**(C) / Assertion (A) is true, but Reason (R) is false	*(Delhi)For Visually Impaired* *2025*

3.	The diagram given below shows labelling of four parts of a dicot embryo during its development as P, Q, R and S.  Choose the option that indicates correct labelling of 'P', 'Q', 'R' and 'S' of embryo in different stages of its development : **P Q R S** (A) Egg Suspensor Radicle Cotyledon (B) Zygote Suspensor Cotyledon Plumule (C) Egg Radicle Suspensor Cotyledon (D) Zygote Suspensor Cotyledon Radicle **Appropriate option:**B)/P- Zygote,Q-suspensor,R-Cotyledon ,S-Plumule	*Delhi(Main Exam)*
4.	How many pollen grains and ovules are likely to be formed in the anther and the ovary of an angiosperm bearing 50 microspore mother cells and 50 megaspore mother cells respectively? (A) 100, 25 (B) 200, 50 (C) 50,50 (D) 200, 100 **Appropriate option:**(B) /200, 50	*Delhi(Main Exam)*
5.	Diameter of the pollen grain generally is (A) 5 to 10 micrometer (B) 10 to 15 micrometer (C) 25 to 50 micrometer (D) 50 to 100 micrometer **Appropriate option:**(C) /25 to 50 micrometer	*Delhi(Main Exam)*
6.	Assertion (A): Perisperm is a diploid tissue.	*Delhi(Main Exam)*

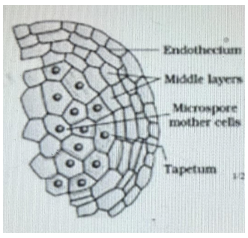
	Reason (R) : Perisperm is the remains of nucellus which surrounds the embryo in certain seeds. **Appropriate option:**(A) / Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of assertion (A).	
7.	Flowers which have single ovule in the ovary and are packed into inflorescence are usually pollinated by (A) Water (B) Bat (C) Bee (D) Wind **Appropriate option:**(D) /Wind	*Delhi(Main Exam)*
8.	Endosperm is completely consumed by the developing embryo in which of the following? (A) Maize and Castor (B) Castor and Groundnut (C) Maize and Pea (D) Pea and Groundnut **Appropriate option:**(D) /Pea and Groundnut	*Delhi(Main Exam)*
9.	Identify the various parts, 'a', 'b' and 'c', in the given diagram of ovule :  Diagram of an ovule (A) a – Embryo sac, b – Inner integuments, c – Outer integuments (B) a – Inner integuments, b – Nucellus, c – Chalazal end (C) a – Hilum, b – Funicle, c – Embryo sac (D) a – Mycropylar end, b – Hilum, c – Inner integuments **Appropriate option:**(C)/a-hilum,b-funicle,c-embryo sac	*Delhi(Comptt.)*

10	Assertion (A): All the events starting from pollen landing on stigma till pollen tube entering the ovule are included in pollen-pistil interaction. Reason (R): Pollen-pistil interaction ensures that only suitable pollens germinate on the stigma. **Appropriate option:**(A) / Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of assertion (A).	*Delhi(Comptt.)*
Q. No.	**Section-B (2 marks Questions)**	
11.	How many meiotic divisions will a wheat plant undergo in order to produce 100 zygotes/100 grains? Calculate and give explanations. OR (b) How many pollen grains and ovules are likely to be formed in the anther and the ovary of an angiosperm bearing 35 microspore mother cells and 35 megaspore mother cells respectively? **SUGGESTIVE VALUE POINTS:** (a) To produce a zygote one megaspore mother cell will undergoes one meiotic division to produce one ovule as it shows megasporic development therefore 100 meiotic divisions will take place to produce 100 zygotes, One microspore mother cell undergoes one meiotic division to produce four pollen grain therefore 25 meiotic division will take place to produce 100 zygotes or 100 pollen grains Total meiotic division 100+25=125 OR (b) Microspore mother cell = 35 So, no. of Pollen grains 35 x 4-140 Megaspore mother cell = 35 So, no. of ovules = 35 (Monosporic development)	*Delhi(Comptt.)* *2025*

12	Given below is a transverse sectional view of an apple. Label the following parts (i) and (ii) and write down their functions.  **SUGGESTIVE VALUE POINTS:** (i) Endocarp (ii) Thalamus Functions- Endocarp - Protects seed Thalamus - Forms the edible part of the fruit	*Delhi(Comptt.)* *2025*
13	Give any three adaptations found in wind-pollinated plants. **SUGGESTIVE VALUE POINTS:** 1. Flowers are small and inconspicuous. 2. Pollen grains are light and dry. 3. Stamen and stigma are exposed.	*(Delhi)For Visually Impaired*
14	a)State the fate of the male nuclei present in the pollen tube. **SUGGESTIVE VALUE POINTS:** **Two male gametes (nuclei) are formed** after the generative cell divides mitotically. As the pollen tube reaches the embryo sac: ● **First male nucleus** fuses with the egg cell → forms the **zygote** (this is **syngamy**). ● **Second male nucleus** fuses with the two polar nuclei in the central cell → forms the **triploid primary endosperm nucleus (PEN)**	*Delhi(Comptt.)*
	SECTION-(E)5 MARKS QUESTION	
15	The study of plants shows that :	*(Delhi)For Visually Impaired*

	(i) Angiosperms or seed-producing plants have the widest distribution. Describe how the presence of seed is advantageous to angiosperms. Mention any three points. (ii) Differentiate between perisperm and pericarp. (iii) What is Polyembryony ? Give an example. **SUGGESTIVE VALUE POINTS:** (i) Angiosperms or seed-producing plants have the widest distribution. 1. Seeds provide protection to the embryo. 2. Seeds help in dispersal. 3. Seeds allow plants to survive unfavorable conditions. (ii) Differentiate between perisperm and pericarp. Perisperm: remains of nucellus, diploid tissue. Pericarp: fruit wall, developed from ovary wall, diploid tissue. (iii)Polyembryony: presence of multiple embryos in a single seed. Example: Citrus seeds.	
16	(a) Distinguish between the two cells enclosed in a mature male gametophyte of an angiosperm. (b) Study the diagram given below showing the modes of pollination. Answer the questions that follow.  (i) The given diagram shows three methods of pollen transfer in plants. Examine them carefully and write the technical terms used for pollen transfer methods '1', '2' and '3'. (ii) How do the following plants achieve pollination successfully? (a) Water lily (b) Vallisneria (iii) Write advantages of pollen transfer in method '3'. **SUGGESTIVE VALUE POINTS:**	*Delhi(Main Exam)* *2025*

	(a)vegetative cell:It is big with abundant food reserve and an irregular shaped nucleus generative cell:Generative cell is small, floats in the cytoplasm of the vegetative cell Helps in the formation of pollen tube (Any one difference) (b) (i)1 - Autogamy,2- Geitonogamy,3- Xenogamy (ii) a =Insects or wind, b = b Water OR (iii) Genetic variation, Healthier offspring. Elimination of recessive traits, Disease resistance Evolution, no inbreeding depression	
17	(i) Draw a diagram of an enlarged view of transverse section (T.S.) of one microsporangium of an angiosperm and label the following parts: Tapetum,Middle layers,Endothecium,Microspore mother cell (ii)Write the function of Tapetum. iii) Explain the following giving reasons: (I) Pollen grains are well-preserved as fossils. (II) Pollen tablets are in use by people these days. OR a) (i) Describe the steps that lead to double fertilisation and triple fusion. ii) Endosperm may be fully consumed by the developing embryo or may persist in the mature seed. Give an example of each type. iii) What is meant by the epicotyl and hypocotyl region of a seed. **SUGGESTIVE VALUE POINTS:** i)Diagram	*Delhi(Comptt.)*

	 (ii) It nourishes the developing pollen grains (iii) (I) Presence of sporopollenin in exine leads to preservation of pollen as fossil as it is most resistant organic material and can withstand high temperature and strong acid and alkali (II) Pollen tablets are rich in nutrients OR (i)-When pollen tube containing two male gametes reaches the ovary of the flower it releases one of the male gametes which fuses with an egg to form zygote,and second male gamete fuses with two polar nuclei present in the Central cell to produce triploid primary endosperm as this involves the fusion of three haploid nuclei it is termed as triple fusion,syngamy and triple fusion together takes place in embryo sac this phenomenon is termed as double fertilization (ii) Completely consumed endosperm by developing embryo-pea/groundnut/ any other correct example,Persistent endosperm-castor/ coconut/maize/ any other correct example(iii) Epicotyl-The portion of embryonal axis above the level of cotyledons, Hypocotyl-The cylindrical portion below the level of cotyledons.	

LESSON -2 -HUMAN REPRODUCTION

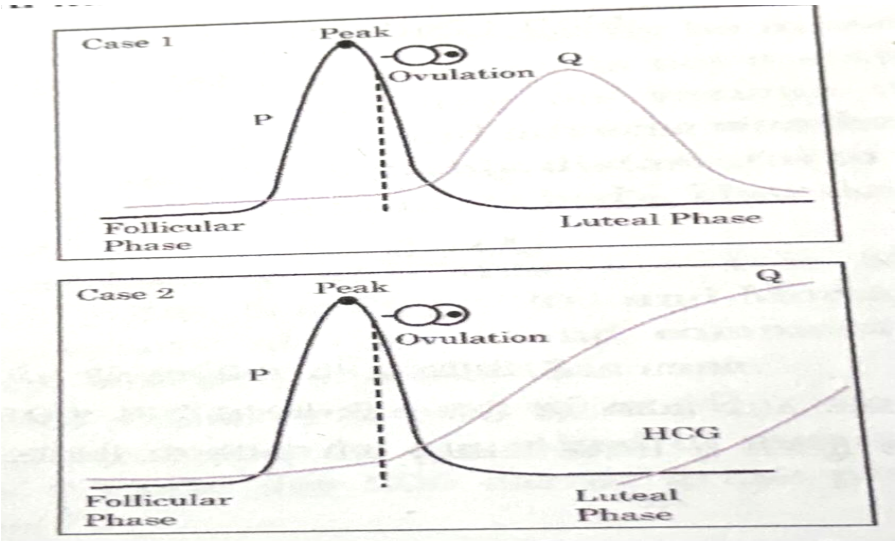
Q. N.	SECTION -(A)1 MARK QUESTION EACH	CBSE 2025
18	Assertion (A): Saheli is the World's first non-steroidal oral contraceptive pill. Reason (R) : It has been developed by National Institute of Immunology, New Delhi. **Appropriate option:** (C) /Assertion (A) is true, but Reason (R) is false.	*Delhi(Main Exam*)

19	Match the following items of Column-I with that of Column-II : **Column-I** **Column-II** (a) Trophoblast (i) Embedding of blastocyst in the endometrium (b) Implantation (ii) Group of cells that would differentiate as embryo (c) Inner cell mass (iii) Embryo with 8-16 blastomeres (d) Morula (iv) Outer layer of blastocyst Choose the option that matches Column-I with Column-II correctly. **Options :** (a) (b) (c) (d) (A) (iv) (i) (ii) (iii) (B) (i) (ii) (iii) (iv) (C) (ii) (i) (iv) (iii) (D) (ii) (iv) (iii) (i) **Appropriate option:** (A)/ a-iv,b-i,c-ii,d-iii	*Delhi(Main Exam*)
20	The menstrual cycle in human females consists of various events.. Select the option that indicates the correct sequence of these events of menstrual cycle. (A) Menstrual phase, Follicular phase, Luteal phase, Ovulatory phase (B) Luteal phase, Follicular phase, Ovulatory phase, Menstrual phase (C) Menstrual phase, Follicular phase, Ovulatory phase, Luteal phase (D) Follicular phase, Luteal phase, Menstrual phase, Ovulatory phase **Appropriate option:** (C) /Menstrual phase, Follicular phase, Ovulatory phase, Luteal phase	*Delhi(Main Exam*)
21	Assertion (A): The mammary glands secrete milk for the nourishment of the young ones. Reason (R) : These are modified sweat glands. **Appropriate option:** B) / Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).	*Delhi(Main Exam*)

22	Which of the following statements are true in respect of chorionic villi in humans? (i) It appears after implantation of human embryo in the uterus. (ii) It becomes interdigitated with cervical tissue of female reproductive tract. (iii) It increases the surface area for exchange of materials. (iv) It develops from the inner cell mass of blastocyst. OPTIONS: (A) (i) and (ii) (B) (ii) and (iii) (C) (i) and (iv) (D) (i) and (iii) **Appropriate option:** (D)/ (i) and (iii)	*Delhi(Comptt.)*
Q. No.	**SECTION-(B)-2 MARKS QUESTION**	
23	(a) (i) What is the ploidy of primary spermatocytes and secondary spermatocytes ? (ii) Point out one difference in first meiotic division of spermatogenesis and oogenesis. Or (i) where leydig cell and sertoli cells are located in human males. ii) What is role of the hypothalamic hormone produced at puberty in human males. **SUGGESTIVE VALUE POINTS:** (a) Primary spermatocytes: diploid (2n) Secondary spermatocytes: haploid (n) (ii) In spermatogenesis, first meiotic division produces two equal-sized secondary spermatocytes. In oogenesis, first meiotic division produces one large secondary oocyte and one small polar body. OR i) Sertoli cells-on inner lining of seminiferous tubule. (ii)Leydig cells outside seminiferous tubule/interstitial cells	*(Delhi)For Visually Impaired*

	GnRH (Hypothalamic hormone) acts on anterior pituitary gland, and stimulates secretion of two gonadotropins (LH and FSH)	
	SECTION -(C)- 3 MARKS QUESTION	
24	(i) Point out one major difference between the function of the urethra of male and female in humans. (ii) Where is the acrosome located in human sperms? Write down its function. OR Describe the structure of the uterus wall and functions performed by any of its two layers. **SUGGESTIVE VALUE POINTS:** (i)In males-Urethra is a common duct which carries both sperms and urine. In females: Urethra carries only urine. (ii)Anterior part of the head of sperm It is filled with enzymes which helps in fertilisation of ovum OR The uterus is a hollow, muscular organ in the female pelvis, and its wall is made up of **three distinct layers**: ● **Endometrium (inner layer):** ○ A mucous membrane lining the inside of the uterus. ○ Composed of two zones: ■ *Functional layer*: thickens and sheds during menstruation. ■ *Basal layer*: regenerates the functional layer after each cycle. ● **Myometrium (middle layer):** ○ Thick muscular layer made of smooth muscle fibers. ○ Provides strength and elasticity to the uterus. ● **Perimetrium (outer layer):** ○ Thin serous membrane (part of the peritoneum).	*(Delhi)For Visually Impaired*
25	Shyam and Radha are expecting their first child with Radha being in her second month of pregnancy with no complications. Shyam's family has a history of cystic fibrosis while Radha's family has a history of Down's syndrome, leading to a concern that the baby may have one of these conditions.	*Delhi(Comptt.)*

	(a) Suggest and explain a way of testing if their baby is at risk for any genetic disorders. (b) In case of presence of one or both of the abnormalities and posing a risk to the mother's health, mention one possible option for them to consider. Is that option safe for Radha at the current gestational age? c)Justify,Under what conditions is the process mentioned illegal? **SUGGESTIVE VALUE POINTS:** i)Amniocentesis:involves sampling amniotic fluid.Detects chromosomal abnormalities and genetic mutations**.** ii)**(b) If Abnormalities Are Found:**If the fetus is diagnosed with CF or Down's syndrome and the condition poses a **serious risk to Radha's health**: ● **Medical Termination of Pregnancy (MTP):** ○ A medically supervised procedure to end the pregnancy. ○ At **8 weeks**, termination is considered **safe** when performed by qualified professionals. ○ Methods include medication (abortion pills) or minor surgical procedures, both relatively safe in the first trimester. **(c) Legal Conditions-**Under the **Medical Termination of Pregnancy Act (India, amended 2021):** ● **Legal if:**Pregnancy is under **20 weeks** (extended to **24 weeks** in special cases).,Risk to mother's physical or mental health.,Fetal abnormalities detected. **Ilegal if:**Termination is done **without medical grounds**.,Performed **after the legal gestational limit** (generally beyond 24 weeks, except with special approval).	
	SECTION -(D)-4 MARKS QUESTION	
26	Study the graphs given below for Case 1 and Case 2 showing different levels of certain hormones and answer the question that follows:	*Delhi(main exam)*



(a) Which hormone is responsible for the peak observed in Case 1 and Case 2? Write one function of that hormone.

(b) Write changes that take place in the ovary and uterus during follicular phase.

Student to attempt either sub-part (c) or (d):

(c) Name the hormone Q of Case 2. Write one function of hormone Q.

OR

(d) Which structure in the ovary will remain functional in Case 2? How is it formed?

SUGGESTIVE VALUE POINTS:

a) Luteinsing hormone /LH helps in ovulation / induce rupturing of graafian follicles

b) Ovary: Maturation of follicles.

Uterus: Proliferation of endometrium lining.

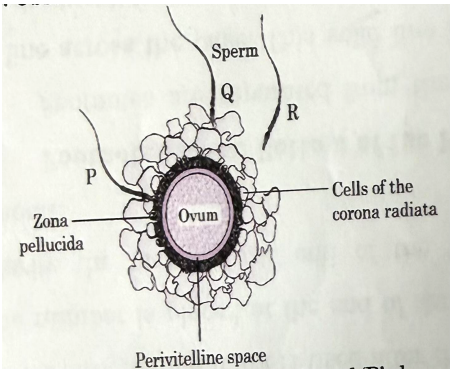
c) Q-Progesterone,

Maintains pregnancy/maintenance of endometrium

OR

d) Corpus luteum, Graafian follicle transforms into corpus luteum after ovulation

SECTION -(E)-5 MARKS QUESTION

27	(i) Name the source of gonadotropins in human females. Explain the changes brought about in the ovary by these hormones during the menstrual cycle. (ii) Name any two specific hormones which are produced by placenta only during pregnancy. (iii) Where are the stem cells located in the human embryo ? What is their significance ? **SUGGESTIVE VALUE POINTS:** **(i)** ● Source: **Anterior pituitary gland** secretes gonadotropins (**FSH and LH**). ● Role: ○ **FSH** stimulates growth of ovarian follicles and estrogen secretion. ○ **LH** triggers ovulation and formation of corpus luteum, which secretes progesterone. **(ii)** ● Two placenta-specific hormones: **Human chorionic gonadotropin (hCG)** and **Human placental lactogen (hPL)**. **(iii)** ● Stem cells are located in the **inner cell mass of the blastocyst**. ● Significance: They are **pluripotent**, capable of differentiating into all tissues and organs of the developing embryo.	*DELHI (MAIN EXAM)*
28	Given below is the diagram of human ovum surrounded by a few sperms. Observe the diagram and answer the questions that follows:  (i) Compare the fate of sperms 'P', 'Q' and 'R' shown in the diagram. (ii) Write the role of Zona pellucida in this process.	*DELHI (MAIN EXAM)*

	(iii) Analyse the changes occurring in the ovum after the entry of sperm. (iv) How acrosome and middle piece of a human sperm are able to play an important role in human fertilization? **SUGGESTIVE VALUE POINTS:** (i)P is able to penetrate or fertilise the ovum, whereas Q and R are unable to penetrate or fertilize. (ii) When a sperm comes in contact with the zona pellucida layer of the ovum it induces changes in the membrane that blocks the entry of additional sperms. (iii) Entry of sperm induces completion of meiotic division of the secondary oocyte and formation of second polar body and a haploid ovum (ootid) (iv)Acrosome: It is filled with the enzyme which helps the sperm to enter into the cytoplasm of the ovum Middle piece: It has numerous mitochondria which produce energy for the movement of tail that facilitate sperm motility for fertilisation	
29.	(i) Where does spermatogenesis occur in human testes? Describe the process of spermatogenesis up to the formation of spermatozoa. (ii) Trace the path of movement of spermatozoa from the testes upto the ejaculatory duct **SUGGESTIVE VALUE POINTS:** (b) (i)Spermatogenesis occur in seminiferous tubules of testes Spermatogonia (at puberty) ↓ mitosis Primary Spermatocytes ↓ 1st Meiosis Secondary Spermatocytes ↓ 2nd Meiosis Spermatids ↓differentiation Spermatozoa	*Delhi(Comptt.)*

	(ii) seminiferous tubulerete testis -vasefferentia → epididymis -vas deferens → -ejaculatory duct	

LESSON -3-REPRODUCTIVE HEALTH

Q. N.	SECTION-(A) 1MARK QUESTION	CBSE-2025
30	IUD used by females as contraceptive device is : (A) Pill (B) Diaphragm (C) Multiload 375 (D) Vault **Appropriate option:** (C) /Multiload 375	*(Delhi)For Visually Impaired*
31	Given below is Column A with a list of certain Assisted Reproductive Technologies (ART), and Column B, with the procedures followed during ART : **Column A (ART)** / **Column B (Procedures)** a. GIFT — i. Transfer of ovum from a donor into the fallopian tube of another female b. ICSI — ii. Transfer of semen from the donor into the vagina of female c. ZIFT — iii. Injecting sperms directly into the ovum d. IUI — iv. Transfer of early embryos into the fallopian tube Select the correct match : (A) a-i, b-ii, c-iii, d-iv (B) a-iv, b-i, c-ii, d-iii (C) a-iv, b-iii, c-i, d-ii (D) a-i, b-iii, c-iv, d-ii	*Delhi(Compt.)*

	Appropriate option: (D) a-i,b-iii,c-iv,d-ii	
	SECTION-(C)-3 MARKS QUESTION	
32	A woman has certain queries as listed below, before starting with contraceptive pills. Answer them. (a) What do contraceptive pills contain? Why are they considered as contraceptives? (b) What schedule should be followed for taking these pills? **SUGGESTIVE VALUE POINTS:** **(a)Contents:** Contraceptive pills generally contain **synthetic hormones** — either a combination of **estrogen and progesterone** (combined oral contraceptives) or only **progesterone** (mini-pills). ● **Why contraceptives:** ○ They **inhibit ovulation** by suppressing release of FSH and LH from the pituitary. ○ They also **alter cervical mucus** and **endometrial lining**, making it difficult for sperm to enter and for implantation to occur. ○ Thus, they prevent pregnancy. **(b)Schedule:** ○ Pills are taken **daily for 21 consecutive days**, starting within the first five days of the menstrual cycle. ○ After 21 days, pills are stopped for **7 days** (during which withdrawal bleeding occurs). ○ The cycle is then **repeated** with a new pack. ● For **mini-pills (progesterone only):** they must be taken **at the same time every day without breaks**.	*Delhi(Compt.)*

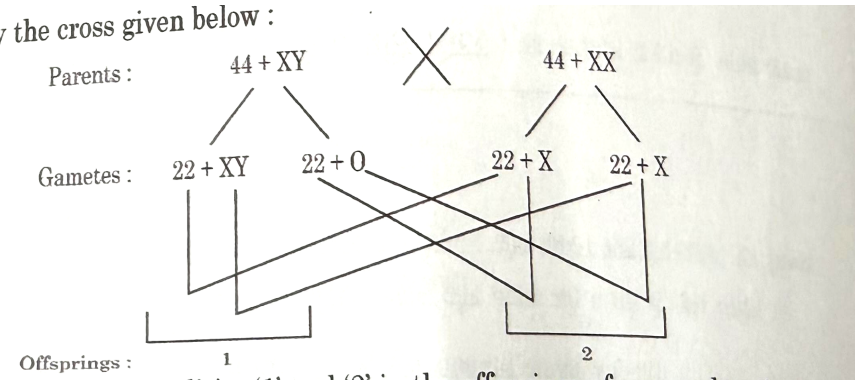
LESSON -4 -PRINCIPLES OF INHERITANCE AND VARIATION

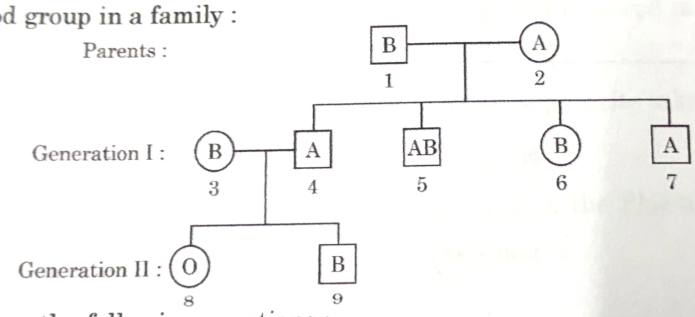
Q. N.	SECTION-(A)-1 MARK QUESTION	CBSE 2025
33.	A disorder caused due to absence of one 'X' chromosomes, i.e. 45 with XO is known as :	*(Delhi)For Visually Impaired*

	(A) Down syndrome (B) Klinefelter syndrome (C) Turner syndrome (D) Thalassemia **Appropriate option:**(C) /Turner syndrome	
34	Which one of the following exhibits ZW (female) and ZZ (male) chromosome type of sex-determination ? (A) Grasshopper (B) *Drosophila* (C) Fowl (Birds) (D) Humans **Appropriate option:**(C)/ Fowl (Birds)	*(Delhi)For Visually Impaired*
35	1. A man whose father was colour-blind marries a woman who had a colour-blind mother and normal father. What percentage of male children of this couple will be colour-blind? (A) 25% (B) 0% (C) 50% (D) 75% **Appropriate option:**(C) /50%	*Delhi(Main Exam*)
36	Assertion (A): When the two genes in a dihybrid cross are situated on the same chromosome, the proportion of parental gene combinations is much higher than non-parental type. Reason (R) : Higher parental gene combinations can be attributed to crossing over between two genes.	*Delhi(Main Exam*)

	Appropriate option:(C) /Assertion (A) is true, but Reason (R) is false.	
37	Assertion (A): When the two genes in a dihybrid cross are situated on the same chromosome, the proportion of parental gene combinations is much higher than non-parental type. Reason (R) : Higher parental gene combinations can be attributed to crossing over between two genes. **Appropriate option:**(C) /Assertion (A) is true, but Reason (R) is false	*Delhi(MAINEXAM)*
38	A Dihybrid cross is done between two parent pea plants (pure line) who differ in two pairs of contrasting traits: Seed colour and seed shape. In the F_2 generation the number of phenotypes and genotypes will be: (A) phenotypes = 4; genotypes 16 (B) phenotypes = 9; genotypes = 14 (C) phenotypes = 4; genotypes=8 (D) phenotypes = 4; genotypes = 9 **Appropriate option:**(D)/ phenotypes = 4; genotypes = 9	*Delhi(Main Exam*)
39	Which of the following is correct for the condition when plant YyRr is back crossed with the double recessive parent? (A) 9:3:3:1 ratio of phenotypes only (B) 9:3:3:1 ratio of genotypes only (C) 1:1:1:1 ratio of phenotypes only (D) 1:1:1:1 ratio of phenotypes and genotypes **Appropriate option:**(D)/ 1:1:1:1 ratio of phenotypes and genotypes	*Delhi(Main Exam*)
40	A man with a certain disease marries a normal woman. They have four children (three daughters and one son). All the daughters suffer from their father's disease but the son is not affected. Which of the following mode of inheritance do you suggest for this disease? (A) Autosome Linked Recessive (B) Sex-linked Dominant	*Delhi(Comptt.)*

	(C) Autosome Linked Dominant D) Sex-linked Recessive **Appropriate option:**(B)/ Sex-linked Dominant	
41	What would be the genotype of parents if the F_1 offspring have the phenotypes in 1 : 1 proportion ? (A) Aa × Aa (B) AA × AA (C) Aa × AA (D) Aa × aa **Appropriate option:**(D)/ Aa X aa	*Delhi(Comptt.)*
42.	Which of the following animals exhibit male heterogamety? (i) Fruit fly. (ii) Fowl. (iii) Human. (iv) Honey bee. (A)(i) and (iii) (B) (ii) and (iv) (C) (ii) and (iii) (D) (i) and (iv) **Appropriate option:**(A)/(i) and (iii)	*Delhi(Comptt.)*
Q. No.	**SECTION-(B)-2 MARKS QUESTION**	
43.	(a) How does polygenic inheritance show deviation from Mendelian inheritance ? **OR** (b) Explain briefly the two non-Mendelian patterns of inheritance that are observed in blood groups of humans. **SUGGESTIVE VALUE POINTS:** **(a)Polygenic inheritance** involves many genes controlling a single trait (e.g., human skin colour, height).Unlike Mendelian inheritance, which shows **discrete**	*(Delhi)For Visually Impaired*

	categories (dominant/recessive), polygenic traits show **continuous variation** and gradations. **OR** **(b)**Human blood groups show two **non-Mendelian patterns**:,**Codominance** → In AB blood group, both alleles (IA and IB) are equally expressed in **Multiple allelism**	
44.	Study the cross given below :  Identify the abnormalities '1' and '2' in the offsprings of a cross done between a couple and distinguish between them. **SUGGESTIVE VALUE POINTS:** 1- Down's Syndrome (45+XX/45+XY)/Trisomy of autosome 2- Klinefelter's Syndrome (44+XXY) Down's syndrome/Trisomy of autosome:Trisomy 21 chromosome/ one extra autosomal chromosome Klinefelter's syndrome:Presence of an extra sex chromosome /Trisomy of sex chromosome (any one relevant difference)	*Delhi(Main Exam*)

45.	Study the pedigree chart given below, showing the inheritance pattern of blood group in a family :  Answer the following questions : (a) Give the possible genotypes of individual 1 and 2. (b) Which antigen or antigens will be present on the plasma membranes of the R.B.Cs of individuals '5' and '8' ? **SUGGESTIVE VALUE POINTS:** (a) Genotype A=Aa, B=aa, C=Aa, D=aa (b) i) Autosomal trait,ii) Dominant	*Delhi(Main Exam)*
46.	A couple believed that hospital authorities have exchanged babies and they have been given another baby by them. The wife is blood group 'A', her husband is blood group 'B' and the child is blood group 'O'. (i) Could the baby be theirs ? (ii) Justify your answer with the help of a cross. **SUGGESTIVE VALUE POINTS:** (a) (i) Yes (ii) Since the blood group of husband and wife is B and A respectively, so their genotype can be I^Bi and I^Ai respectively Parents I^Bi , and I^Ai Parents: Father X Mother Blood group: A B Genotype: I^Ai I^Bi Gametes: I^A i I^B i Children: I^AI^B I^Ai I^Bi i i Blood group: AB A B O	*Delhi(Comptt.)*
	SECTION-(D)-4 MARKS QUESTION	

47	Read the passage and answer sub-questions with internal choice in one sub-question. The chromosome number is fixed for all normal organisms leading to spécies specification, whereas any abnormality in the chromosome number of an organism results into abnormal individuals. Sometimes an error may occur during meiosis of cell cycle, where the sister chromatids fail to segregate, called non-disjunction, leading to the production of abnormal gametes with altered chromosome number. On fertilization, such gametes develop into abnormal individuals. (a) State what is aneuploidy. (b) A normal human sperm (22 + Y) fertilizes an ovum with karyotype (22+ XX). Name the disorder of the offspring thus produced and write any two symptoms of the disorder. (c)(i) What is meant by trisomy? Mention the chromosome number that shows trisomy in Down's syndrome. OR (ii) Write any two symptoms of Down's syndrome. **SUGGESTIVE VALUE POINTS:** a) Failure of segregation of chromatids during cell division cycle results in gain or loss of chromosome(s) called aneuploidy (b)Klinefelter syndrome:Symptoms Overall masculine development however the feminine development (development of breast/ Gynaecomastia) is expressed, they are sterile, tall stature with feminised character (Any two symptoms) (c) (i)Presence of additional copy of a chromosome Chromosome no. 21 OR(c)(ii)Symptoms Short statured with small round head,furrowed tongue, partially open mouth, broad palm with characteristic crease, physical/psychomotor/mental development is retarded, flat back of head, broad flat face, many loops on finger tips, congenital heart disease, big and wrinkled tongue	*Delhi(Comptt.)*
	SECTION-(E)-5 MARKS QUESTION	
48	i) Perform a cross between two sickle cell carriers. What ratio is obtained between carrier, disease free and diseased individuals in F_1 progeny? Name the nitrogenous base substituted, in the haemoglobin molecule in this disease.	*Delhi(Main Exam*)

(ii) Explain the difference in inheritance pattern of flower colour in garden pea plant and snap-dragon plant with the help of monohybrid crosses.

OR

(A) (i) Haemophilia and red green colourblindness is usually observed in men. Why?

(ii) Perform a cross(es) where haemophilic daughter(s) and haemophilic son(s) are produced in same ratio.

SUGGESTIVE VALUE POINTS:

Sickle cell cross and molecular change

- **Cross (carriers):** Parents: **AS × AS** F_1 genotypes: **AA (normal)**, **AS (carrier)**, **SS (diseased)**
    - **Ratio:**
        - **Disease-free (AA):** 1
        - **Carrier (AS):** 2
        - **Diseased (SS):** 1
        - So, **AA : AS : SS = 1 : 2 : 1**
- **Molecular change:**
    - **Amino acid substitution: Valine replaces glutamic acid** at the 6th position of β-globin.
    - **DNA base change: Adenine → Thymine** in the β-globin gene (codon changes from GAG to GTG).

Monohybrid inheritance: pea vs snapdragon

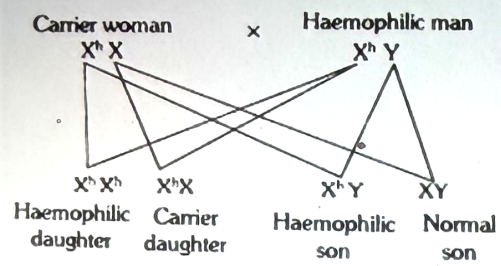
Garden pea (complete dominance)

- **Parents: TT (purple) × tt (white)**
- **F_1:** All **Tt (purple)** — dominant phenotype masks recessive.
- **F_2 (Tt × Tt):**
    - **Genotypic ratio: 1 TT : 2 Tt : 1 tt**
    - **Phenotypic ratio: 3 purple : 1 white**

OR

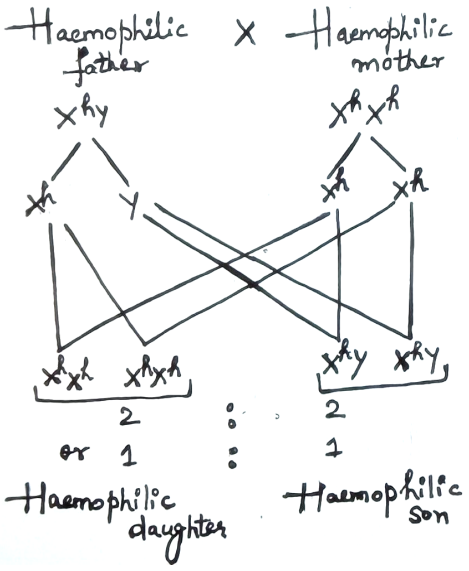
(A) (i) Both are sex-linked/ X-linked recessive disorder
Males usually have only single X chromosome so disease is easily expressed.

(ii)
Cross-1



Ratio 1:1
Haemophilic daughter:Haemophilic son
(1 mark for the correct genotype of the parents and 1 mark for the correct cross)

Cross-2

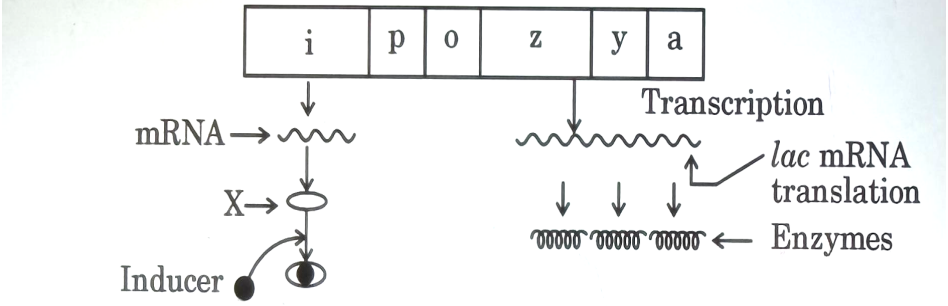


LESSON- 5-MOLECULAR BASIS OF INHERITANCE

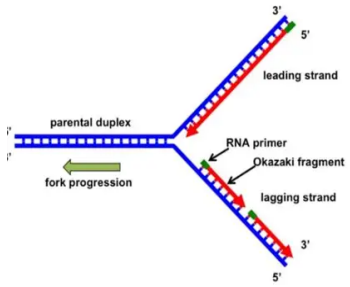
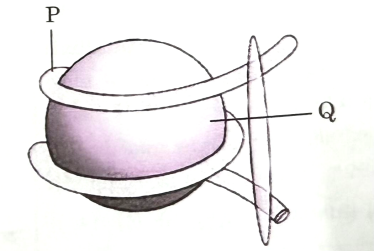
Q. N.	SECTION-(A)- 1 MARK QUESTIONS	CBSE 2025

49	Which scientist's observation helped us to calculate proportion of bases in a double-stranded DNA ? (A) James Watson (B) Matthew Meselson (C) Rosalind Franklin (D) Erwin Chargaff **Appropriate option:**(D)/ Erwin Chargaff	*(Delhi)For Visually Impaired*
50	RNA was considered as the first genetic material. Out of the evidences listed below, point out the correct evidence : (A) Essential life processes do not involve RNA (B) RNA is a double-stranded structure (C) RNA can act as catalysts (D) RNA, like protein enzymes, are stable **Appropriate option:**(C) /RNA can act as catalysts	*(Delhi)For Visually Impaired*
51	Regulation of *lac* operon by repressor is referred to as which of the following type of regulation ? (A) Both positive and negative regulation (B) Only negative regulation (C) Only positive regulation (D) Sometimes positive, sometimes negative regulation **Appropriate option:**(B)/ Only negative regulation	*(Delhi)For Visually Impaired*
52	Which of the following options is a Stop codon ? (A) UUU (B) UGA (C) UGU	*(Delhi)For Visually Impaired*

	(D) UAC **Appropriate option:**(B) /UGA	
53	*Assertion (A) :* The template strand has the polarity of 5 3 and sequences are same as RNA (except thymine at the place of uracil). *Reason (R) :* The strand that is referred to as coding strand does not code for anything. **Appropriate option:**(D) Assertion (A) is false, but Reason (R) is true	*(Delhi)For Visually Impaired*
54	Assertion (A): One of the property of genetic code is degeneracy. Reason (R) : Some amino acids can be coded by more than one codon. **Appropriate option:**A) Both Assertion (A) and Reason (R) are true and Reason(R) is the correct explanation of the Assertion (A).	*Delhi(Main Exam*)
55	The sequence of nitrogenous bases in a segment of a coding strand of DNA in AATGCTAGGCAC 3'. Choose the option that shows the correct sequence of nitrogenous bases in the mRNA transcribed by the DNA. (A) 5-UUACGAACCGAG-3 (B) 5'-AAUGCUAGGCAC-3 (C) 5-UUACGUACCGUG-3' (D) 5'-AACGUAGGCAGC-3 **Appropriate option:**(B)/ 5'-AAUGCUAGGCAC-3	*Delhi(Main Exam*)
56	During elongation process of translation ,the peptide bond formation between amino acid is catalysed by a)r RNA b)mRNA c)tRNA d)snRNA **Appropriate option:** A)/r RNA	*OUTSIDE Delhi*
57	What would happen if in a gene encoding a polypeptide of 51 amino acids, codon present at 32 position (UAU) is mutated to UGA?	*Delhi(Compt.)*

	Select the option that indicates the polypeptide with correct number of amino acids formed after mutation. (A) A polypeptide of 50 amino acids will be formed. (B) A polypeptide of 32 amino acids will be formed. (C) Two polypeptides of 20 and 31 amino acids will be formed. (D) A polypeptide of 31 amino acids will be formed. **Appropriate option:**(D)/ A polypeptide of 31 amino acids will be formed	
58	Assertion (A): DNA chemically is less reactive and structurally more stable when compared to RNA. Reason (R): DNA has 2'- OH group present at every nucleotide, which makes it more stable than RNA. **Appropriate option:**(C) /Assertion (A) is true, but Reason (R) is false	*Delhi(Comptt.)*
Q. No.	**SECTION-C-3 MARKS QUESTION**	
59	Observe the diagram given below and answer the following questions.  (i) Name the molecule 'X' synthesized by 'i' gene. (ii) Which one of the structural genes codes for β-galactosidase ? (iii) When will the transcription of this gene stop ? **SUGGESTIVE VALUE POINTS:**	*Delhi(Comptt.)*

	(i) The molecule X' is repressor (ii) z gene codes for ß-galactosidase (iii) In the absence of lactose or inducer	
60	What is a replication fork ? How does it aid replication of long strands of DNA ? **SUGGESTIVE VALUE POINTS:** **Replication Fork:**A **replication fork** is the **Y-shaped structure** formed when the double-stranded DNA unwinds and separates during replication. ● It is created by the action of **helicase**, which breaks hydrogen bonds between complementary bases, exposing single strands for copying. **How it Aids Replication of Long DNA Strands** At the fork, **DNA polymerases** synthesize new strands: ○ **Leading strand** → synthesized continuously in the 5′→3′ direction. ○ **Lagging strand** → synthesized discontinuously as short **Okazaki fragments**, later joined by DNA ligase	*(Delhi)For Visually Impaired*
61	What is polymorphism in DNA ? Give any two applications of DNA polymorphism. **SUGGESTIVE VALUE POINTS:** **Polymorphism in DNA:** ● DNA polymorphism refers to the **variation in DNA sequences among individuals of a population**. ● These variations are heritable and can be detected using molecular techniques (e.g., RFLP, VNTR, SNPs). **Two applications:** 1. **DNA fingerprinting** → used in forensic science, paternity testing, and criminal investigations. 2. **Genetic mapping/marker studies** → helps in locating genes associated with diseases or traits in humans and plants.	*(Delhi)For Visually Impaired*
62	Draw a labelled schematic sketch of replication fork of DNA. Explain the role of any two enzymes involved in DNA replication. **SUGGESTIVE VALUE POINTS:**	*Delhi(Comptt.)*

	Labelled diagram  **1. DNA Helicase** ● Role: Unwinds the double helix by breaking hydrogen bonds between complementary bases. ● Importance: Creates the **replication fork**, exposing single strands so they can be copied. **2. DNA Polymerase** ● Role: Synthesizes new DNA strands by adding nucleotides complementary to the template strand in the 5′→3′ direction. ● Importance: Ensures accurate duplication of genetic material; also proofreads to correct error	
63	 a) Identify the structure shown in the above figure. (b) Identify the labels P and Q. (c) Write the nature of histone proteins. (d) Distinguish between Euchromatin and Heterochromatin. **SUGGESTIVE VALUE POINTS:** i). P. DNA wrapped around histones,Q-Histone core (HZA, H2B H3, H4) (2) Histane proteins are basic, positively charged protiens that play a crucial role in DNA packaging within eukaryotic	*Delhi(Main Exam)*

	(a) Difference between euchromatin and hetero chromatin Euchromaten;Loosely packed form of chromatin that is transcriptionally active,lightly stained нeterochтomatin:Tightly packed chromatin that is transcriptionally inactive, darkly stained	
	SECTION-(E)-5 MARKS QUESTION	
64	Explain with the help of well-labelled diagrams how lac operon operates in E. coli: (i) In presence of an inducer. (ii) In absence of an inducer. **SUGGESTIVE VALUE POINTS:** **(i) In absence of inducer (lactose)** ● The **regulator gene (lacI)** produces a **repressor protein**. ● The repressor binds to the **operator region**, blocking RNA polymerase from transcribing structural genes. ● Result: **No enzymes** for lactose metabolism are produced. **Diagram description:** ● Show DNA with promoter, operator, and structural genes. ● Repressor protein bound to operator. ● RNA polymerase blocked, no transcription arrow. **(ii) In presence of inducer (lactose/allolactose)** ● Lactose (inducer) binds to the **repressor protein**, inactivating it. ● The repressor cannot bind to the operator. ● RNA polymerase binds to the promoter and transcribes **lacZ, lacY, lacA**. ● Result: Enzymes (β-galactosidase, permease, transacetylase) are produced, enabling lactose utilization. **Diagram description:** ● DNA with promoter, operator, and structural genes. ● Repressor protein bound to inducer (inactive). ● RNA polymerase moving along DNA, transcription arrows toward lacZ, lacY, lacA.	*Delhi(Main Exam*)

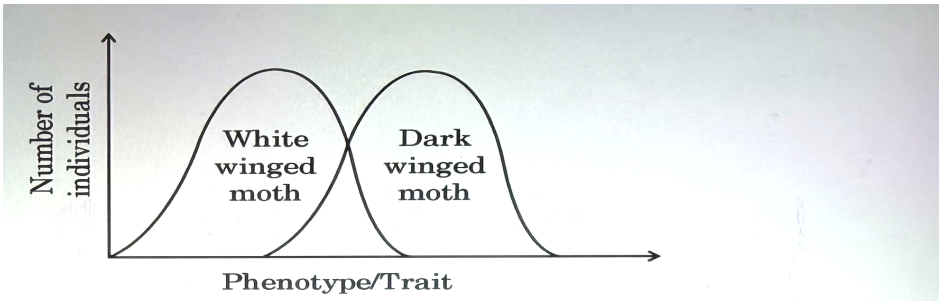
65	(I) Why did Hershey and Chase use 35S and 32P in their experiments? Explain. (II) Write the conclusion they reached at the end of the experiment. (ii) Draw a clover leaf-like structure of tRNA showing the following: OR (I)Tyrosine attached to the amino acid site. (II) Anticodon for this amino acid in its correct site (codon for tyrosine is UAC). **SUGGESTIVE VALUE POINTS:** **(I) Hershey and Chase Experiment** ● **Why ^{35}S and ^{32}P were used:** ○ **^{35}S (radioactive sulfur):** Labels **protein coat** of bacteriophage, since proteins contain sulfur (in amino acids like methionine and cysteine) but DNA does not. ○ **^{32}P (radioactive phosphorus):** Labels **DNA**, since DNA contains phosphorus (in phosphate groups) but proteins do not. ○ This allowed them to distinguish whether protein or DNA entered the bacterial cell during infection. ● **Conclusion:** ○ Only **^{32}P-labeled DNA** entered the host bacterial cell and was passed on to progeny phages. ○ **^{35}S-labeled protein** remained outside. ○ Therefore, **DNA is the genetic material**, not protein. **(II) Clover-leaf Structure of tRNA (for Tyrosine)** **Description of diagram (for visually impaired format):** ● The tRNA molecule is drawn as a **clover-leaf shape** with four arms: 1. **Amino acid acceptor arm (top):** Tyrosine attached at the 3′ end (CCA sequence). 2. **Anticodon arm (bottom):** Contains the anticodon **AUG**, complementary to codon **UAC** for tyrosine. 3. **D arm (left):** Contains dihydrouridine bases. 4. **TΨC arm (right):** Contains ribothymidine, pseudouridine, cytidine. **Labels to include in diagram:** ● Tyrosine at amino acid site (top). ● Anticodon AUG at anticodon loop (bottom). ● D arm and TΨC arm on sides.	*Delhi(Comptt.)*

	• Overall clover-leaf shape.	

LESSON -6- EVOLUTION

Q. N.	Section-(A) 1 MARK QUESTIONS	CBSE 2025
66	Species which have diverged after origin from common ancestor giving rise to new species, adapted to new habitats and ways of life is called : (A) Adaptive radiation (B) Divergent evolution (C) Convergent evolution (D) Mutation **Appropriate option:**(A)/ Adaptive radiation	*(Delhi)For Visually Impaired*
67	Evolution of modern man involves the following man-like primates. Choose the correct series of human evolution. (A) *Dryopithecus- Homo erectus → Australopithecines → Homo sapiens* *(B) Australopithecines -Homo erectus → Neanderthal→ Homo sapiens* *(C) Australopithecines → Ramapithecus → Dryopithecus -Homo sapiens* *(D) Homo erectus -Australopithecines -Homo sapiens- Neanderthal* **Appropriate option:***B) /Australopithecines -Homo erectus → Neanderthal→ Homo sapiens*	*Delhi(Main Exam*)
68	The chronological order of evolution of modern man from man-like primates is given below.Choose the option that indicates the evolution of man in correct order from early to recent times: (A) *Australopithecines→ Ramapithecus→ Homo habilis → Homo erectus→ Homo sapiens* *(B) Ramapithecus → Australopithecines→Homo erectus→ Homo sapiens→* *Homo habilis*	*Delhi(Compt.)*

	(C) Ramapithecus →Homo habilis→ Australopithecines→ Homo erectus→ Homo sapiens (D) *Australopithecines→ Homo habilis→ Homo sapiens → Ramapithecus→ Homo erectus* **Appropriate option:***(B) /Ramapithecus → Australopithecines→Homo erectus→ Homo sapiens→ Homo habilis*	
	SECTION-(C)-3 MARKS QUESTION	
69	Compare and contrast convergent and divergent evolution?Also give one point of similarity between them. **SUGGESTIVE VALUE POINTS:** Convergent evolution is like, when different species develop similar traits in response to similar environmental pressures, Think of wings - birds, insects, and bats all developed wings separately to fly. Divergent evolution is when related species diverge and become more dissimilar over time, usually due to different environments. Like, finches on the Galapagos Islands, they all had a common ancestor but developed different beak shapes and sizes. Similarity: Both involve evolution and adaptation to environments	*Delhi(Main Exam*)
	SECTION-(D)-4 MARKS QUESTION	
70	Read the following passage and answer the questions that follow. In a given population, the frequency of occurrence of alleles of a gene or a locus is supposed to remain fixed and even remain the same through generations. Hardy-Weinberg principle stated it using algebraic equations. Certain factors are known to affect Hardy-Weinberg equilibrium. These are gene migration, genetic drift, etc. When migration of a section of population to another place and population occur, gene frequencies change in the original as well as in the new population. Sometimes the change in allele frequency is so different in the new sample of population that they become a different species. (a) Define Hardy-Weinberg equilibrium. (b) What do you understand about the Founder effect ? (c) (i)Gene migration can affect Hardy-Weinberg	*(Delhi)For Visually Impaired*

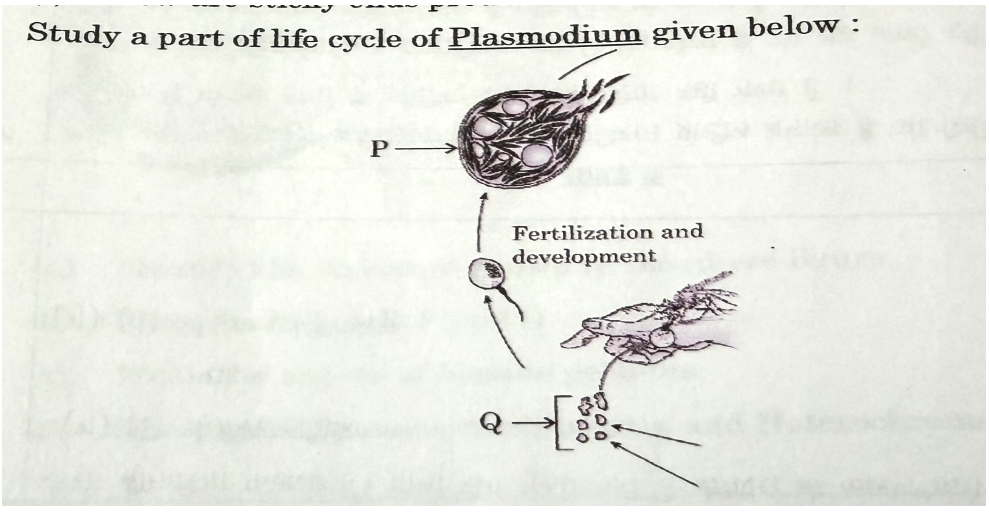
	OR (c) (ii) How can mutations result in evolution ? Explain. **SUGGESTIVE VALUE POINTS:** (a) Hardy-Weinberg equilibrium states that allele frequencies in a population are stable and is constant from generation to generation /the gene pool (total genes and their alleles in a population) remains constant /sum total of all the allelic frequencies is 1. (b) Sometimes the change in allele frequency is so different in the new sample of population that they become a different species, the original drifted population becomes founders and the effect is called as founder effect. (c) (i) When a section of population migrates (gene migration) to another place the gene frequencies in the original as well as in the new population change thus deviating from Hardy-Weinberg equilibrium /New genes or alleles are added to the new population and these are lost from the old population thus deviating from Hardy-Weinberg equilibrium. OR (c) (ii) Mutation causes sudden change in the genes (genotype) in a population leading to evolution.	
	SECTION-(E)5 MARKS QUESTION	
71	 Natural selection operates in different ways in nature. (I) In England after industrialisation, the population of dark winged moths were more favoured than white winged moths. Explain. (II) Identify the type of natural selection depicted in the graph above. **SUGGESTIVE VALUE POINTS:**	*Delhi(Compt.)*

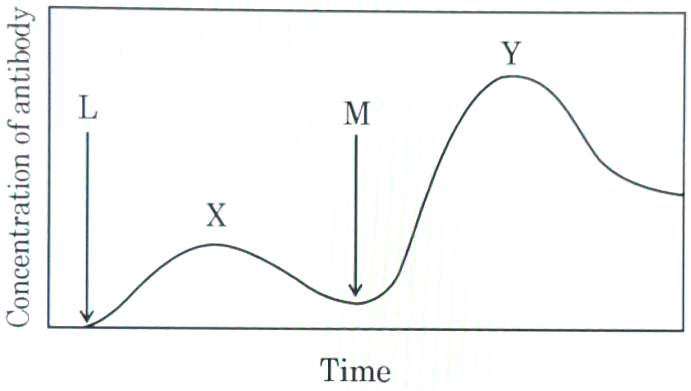
	(a) (i) (I)After industrialisation tree trunk became dark due to deposition of soot and smoke, so in that background dark winged moths could survive better than white so population of dark winged moths increased. (II) directional natural selection (ii) Hugo deVries – Single step large mutation or saltation leads to speciation. **(Any one difference)**	

Hugo deVries	Darwin
1. Single step large mutation causes evolution.	1. minor variations causes evolution.
2. Mutations are random and directionless.	2. variations are small and directional.
3. Evolution is sudden	3. Evolution is gradual

LESSON-7 -HUMAN HEALTH AND DISEASES

Q. N.	SECTION-(A)- 1 MARK QUESTIONS	CBSE 2025
72	Transplantation of tissues/organs to some patients often fails due to rejection of such tissues/organs by the body of the patient. Which type of immune response is responsible for such rejections ? (A) Autoimmune response (B) Humoral immune response (C) Physiological immune response (D) Cell mediated immune response **Appropriate option:**(D) /Cell mediated immune response	*Delhi(Main Exam*)
Q. No.	**SECTION-(B)-2 MARKS QUESTIONS**	

73	What function is performed by tears shed by our eyes ? Which type of barrier is this in the process of immunity ? Give another similar example. **SUGGESTIVE VALUE POINTS:** To prevent microbial growth Physiological barrier Saliva in mouth / acid (HCl) in the stomach (any one example)	*(Delhi)For Visually Impaired*
74	How are morphine and heroin related? Mention their effect on the human body. **SUGGESTIVE VALUE POINTS:** Morphine and heroin are like two peas in a pod, but with different effects. Both are opioids, derived from the opium poppy plant. Heroin is essentially morphine's sneaky cousin. When morphine is processed, it gets converted into heroin (diacetylmorphine) through acetylation, making it more potent and faster-acting. Think of heroin as a morphine prodrug – it converts back to morphine in the brain. **Effects on the Human Body**:Pain Relief: Both morphine and heroin bind to opioid receptors, dulling pain and producing feelings of euphoria.Respiratory Depression: They slow down breathing, which can be life-threatening in high doses. Heroin is often abused for its intense, rapid high, while morphine is commonly prescribed for pain management. Both require careful medical supervision.	*Delhi(Comptt.)*
75	 Answer the following questions:	*Delhi(Main Exam)*

	(a) Name the infective stage of Plasmodium that is stored in the female Anopheles mosquito. (b) Where does fertilization and development of parasite take place? (c) Identify labels P and Q in the given diagram. (d) Asexual and sexual phase of the life cycle of the Plasmodium takes place in two different hosts. Write their names. **SUGGESTIVE VALUE POINTS:** (a) Sporozoites (b) In the gut of the female Anopheles mosquito (c) P: Salivary glands Q: Gametocytes (d) Asexual phase = In human Sexual phase In mosquito	
	SECTION-C-3 MARKS QUESTIONS	
76	The graph given below indicates the administration of the first (L) and second dose (M) of a vaccine. The corresponding response of the body is indicated by X and Y. Interpret the graph and explain the reason for such a response shown by the body.  **SUGGESTIVE VALUE POINTS:** On administration of first dose (L) of a vaccine the body response is of low intensity (X) as the immune system is coming in contact with weak antigens first time (Primary response), but on administration of second dose (M) with same antigen body response becomes intensified as secondary response (Y) -Because of formation of memory cells on first encounter with the antigen the secondary response is faster and stronger.	*Delhi(Comptt.)*

77	(a) Why do sportspersons often fall victim to coccaine addiction ? Name the plant from which this drug is derived. Also write down the mode of action of this drug. (b) Name one drug and its harmful effect obtained from latex of Poppy plant. **SUGGESTIVE VALUE POINTS:** (a) Cocaine Addiction in Sportspersons:Sportspersons often fall victim to cocaine addiction because it enhances alertness, energy, and focus, giving them a perceived competitive edge. Cocaine is derived from the *Erythroxylum coca* plant, native to South America. Mode of Action:Cocaine works by blocking dopamine reuptake in the brain, flooding the reward system with feel-good chemicals. This leads to intense euphoria, increased energy, and heightened alertness. However, it also causes vasoconstriction, increased heart rate, and risk of addiction and cardiovascular issues. (b) Drug from Poppy Plant:One drug obtained from the latex of the Poppy plant (*Papaver somniferum)* is Morphine. Its harmful effects include: - Addiction: Morphine can lead to physical dependence and addiction. - Respiratory Depression: Overdose can slow down breathing, potentially leading to coma or death. - Withdrawal Symptoms: Stopping or reducing use can cause intense withdrawal symptoms.	*Delhi(Comptt.)*
	SECTION -(D)-4 MARKS QUESTIONS	
78	Generally all of us have been vaccinated at various ages according to a schedule. Certain vaccines are taken only once and yet protection is provided for a long time or even for a lifetime in some cases. (a) What name is given to such a type of immune response ?Also name the property which is responsible for it. (b) What are the types of this immune response ? Describe briefly. (c) (i) What are the special types of blood cells that help to achieve this type of immunity and how ? **OR** (c) (ii) What is anamnestic response ? **SUGGESTIVE VALUE POINTS:**	*(Delhi)For Visually Impaired*

	a)Acquired Immunity or Active Immunity,based on memory (b) Two types of immune response areHumoral response, antibodies found in the blood.Cell mediated response, T-lymphocytes mediate CMI.-Primary immune response, when our body encounters a pathogen for the first time.Secondary immune response, subsequent encounter with a same pathogen elicits a highly intensified response. (c) (i) B-cells or B-lymphocytes produce an army of proteins (called antibodies) in response to pathogens into our blood to fight the pathogens.T-cells or T-lymphocytes themselves do not produce (secrete) antibodies but help B-cells to produce them. OR(c) (ii) Anamnestic response is highly intensified secondary immune response on subsequent encounter with same pathogen after primary response.	
	SECTION-(E)-5 MARKS QUESTIONS	
79	Answer the following questions: (1) State what do you understand by "MALT"? Where is it located inside our body? (ii) Explain cytokine barriers. (iii) Name the diagnostic test for AIDS. On what principle does it work? (iv) Bone marrow and thymus play important roles in the human OR immune system. Explain how they are able to achieve this. **SUGGESTIVE VALUE POINTS:** A) (i)MALT is Mucosa Associated Lymphoid Tissue,It is located within the lining of the major tracts like Respiratory or digestive or urogenital tract. (ii)Cytokine barriers - virus infected cells secrete proteins called interferons which protect non-infected cells from further viral infection. (iii)Enzyme Linked Immunosorbent Assay or ELISA, ELISA is based on the principle of antigen-antibody interaction /PCR or Polymerase Chain Reaction, amplification of nucleic acid (iv)Both Bone marrow and thymus provide micro- environment for the development and maturation of T-lymphocytes / immature lymphocyte differentiate into antigen sensitive lymphocytes / Bone marrow is the main lymphoid organ where all blood cells including lymphocytes are produced and some lymphocytes migrate to thymus for development and maturation	*Delhi(Main Exam*)

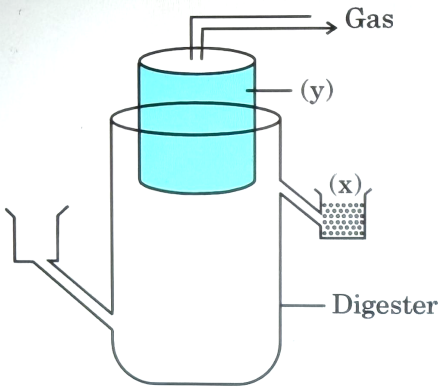
LESSON- 8-MICROBES IN HUMAN WELFARE

Q. N.	SECTION-(A)-1 MARK QUESTION	CBSE 2025
80	The bioactive molecules are matched with their source organism and functions. Select the ***incorrect*** pair : (A) Fungus Cyclosporin A, Immunosuppressive agent (B) Yeast Statins, Blood-cholesterol lowering agent (C) Fungus Streptokinase, Clot buster (D) Microbes Enzyme, Lipase, used in detergent formulations **Appropriate option:**C) /Fungus Streptokinase, Clot buster	*(Delhi)For Visually Impaired*
81	Which of the following given options serves as an inoculum in sewage treatment plants ? (A) A small part of activated sludge (B) A small part of primary sludge (C) Aerobic microbes (D) Floating debris **Appropriate option:**(A) /A small part of activated sludge	*(Delhi)For Visually Impaired*
82	*Assertion (A) :* Antibiotics are chemical substances, which are produced by some microbes and can kill or retard the growth of other disease-causing microbes. *Reason (R) :* All micro-organisms like fungi, bacteria,protozoans are used to produce antibiotics. **Appropriate option:**(C) /Assertion (A) is true, but Reason (R) is false	*(Delhi)For Visually Impaired*

83	Match the items in Column-A with that of Column-B : **Column-A** **Column-B** (i) Lady bird beetle (a) Methanobacterium (ii) Mycorrhiza (b) Trichoderma (iii) Biological control (c) Aphids (iv) Biogas (d) Glomus Choose the option that matches the items of Column A with that of B correctly : **Options :** (i) (ii) (iii) (iv) (A) (b) (d) (c) (a) (B) (c) (d) (b) (a) (C) (d) (a) (b) (c) (D) (c) (b) (a) (d) **Appropriate option:**(B)/i- c,ii-d,iii-b,iv-a	*Delhi(Main Exam*)
84	Assertion (A): While working on Staphylococci, Alexander Fleming observed that Penicillium notatum inhibits the growth of bacteria. Reason (R) : The inhibiting chemical was commercially extracted and its full potential was established by Alexander Fleming. **Appropriate option:**(C) /Assertion (A) is true, but Reason (R) is false.	*Delhi(Main Exam*)
Q. No.	**SECTION-(B)-2 MARKS QUESTION**	
85	Name an alcoholic drink which is produced by the help of microbes: (1) With distillation (2) Without distillation or (ii) Explain how cyanobacteria can be used as bio-fertilizer. **SUGGESTIVE VALUE POINTS:** (i)(1) Whisky/Brandy/ Rum (anyone)	*Delhi(Main Exam*)

	(2) Wine/ Beer (anyone) OR(ii) Cyanobacteria fix atmospheric nitrogen, add organic matter to soil and increase soil fertility.	
86	Though baculoviruses are pathogens, they are used as biological control agents. Give three reasons why they are preferred. **SUGGESTIVE VALUE POINTS:** Baculoviruses are1. Target-specific: Baculoviruses are species-specific, meaning they only infect specific pest insects, sparing beneficial insects, birds, and mammals. It's like a precision-guided missile for pests! 2. Non-toxic to non-targets: Unlike chemical pesticides, baculoviruses are safe for humans, wildlife, and the environment. They're biodegradable and eco-friendly. 3. Biodegradable and sustainable: Baculoviruses break down naturally, reducing environmental residue and promoting sustainable pest management. Plus, they can be produced easily in insect hosts. These advantages make baculoviruses a popular choice for integrated pest management (IPM) strategies.	*(Delhi)For Visually Impaired*
	SECTION-(E)-5 MARKS QUESTION	
87	(i) Study the following table & fill 'H', 'I', 'J', 'K', 'L' and 'M' in following table with suitable words : (ii) Why are baculoviruses used as biological control agents ? **SUGGESTIVE VALUE POINTS:**a) H = *butylicum,I = Bacteria* *b) J = Statin,K = /Yeast*	*Delhi(Main Exam*)

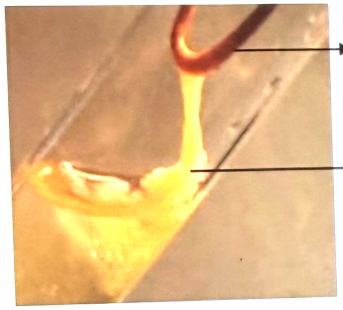
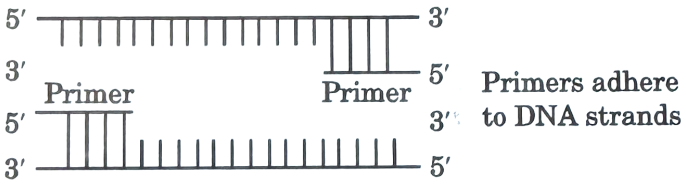
	Chemical / Bioactive Molecule	Micro-organism	Category	Use
(a)	Butyric acid	H	I	Important applications in food, chemical & pharma industry
(b)	J	Monoscus purpureus	K	Inhibit cholesterol biosynthesis pathway
(c)	Cyclosporin A	L	Fungus	M

	c) L = Trichoderma polysporum OR M = Immunosuppressant /Suppress immune system in patients with newly transplanted organs (ii)Baculovirus are species specific, narrow spectrum insecticidal properties,No negative impact on non target species like plants or mammals or birds or fishes or Any other valid point.(Any two point)	
88	(a) (i) Identify the disease in which the body cells of the patient lose the property of contact inhibition. State its possible causes (any three). Also name any two methods to detect and to diagnose this disease. (ii) Your classmate complains of headache and cough. The doctor confirms that he is suffering from pneumonia and not common cold, on the basis of certain symptoms. List these symptoms and write any two precautions to be followed to prevent the spread of this disease. **SUGGESTIVE VALUE POINTS:**(a) (i)Cancer/Malignant tumor,Causes -X Rays, Gamma rays, UV Rays, carcinogens in Tobacco, oncogenic virus treatment:Biopsy, Radiography (X Rays), CT scan, MRI, PCR, Antibody against cancer specific antigen can also be used (ii) Symptoms-fever, chills, tip of nails may turn blue or grey. Precautions:Stay away from the patient, do not share the articles like glass or utensils of infected person with a healthy one, try to cover the nose while sneezing so that air droplets should not spread to healthy individuals.	*Delhi(Comptt.)*
89	Study the diagram of a typical biogas plant and answer the following questions :  .	*Delhi(Comptt.)*

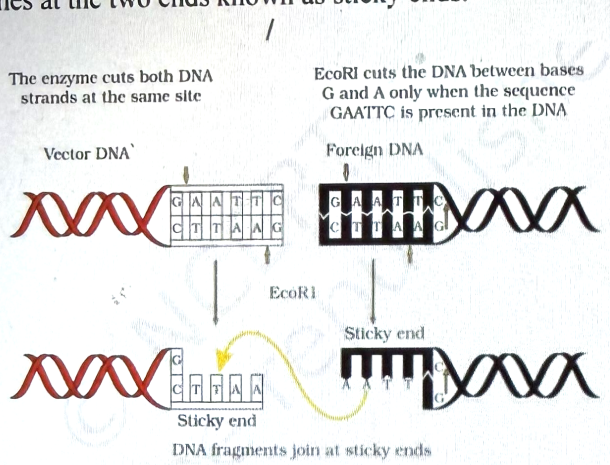
	(i) Identify 'x' and 'y'. (ii) Write three components of biogas. Name one microorganism which is involved in biogas production. iii) Name two institutes which developed the technology of biogas production in India. **SUGGESTIVE VALUE POINTS:**(b) (i) X-Sludge tank,Y-Gas holder (ii)Methane, CO2 and H2.Methanobacterium (iii) IARI /Indian Institute of Agricultural Research, KVIC/Khadi and Village Industries Commission	

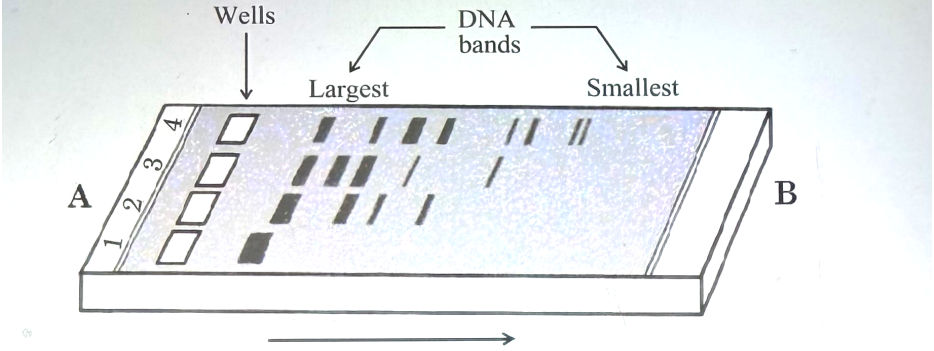
LESSON 9-BIOTECHNOLOGY -PRINCIPLES AND PROCESS

Q. N.	SECTION-(A)-1 MARK QUESTION	CBSE 2025
90.	Select the correct option about plasmid from the given options : (A) Extrachromosomal circular DNA (B) Double-stranded chromosomal DNA (C) Single stranded rRNA (D) Single stranded tRNA **Appropriate option:**(A)/ Extrachromosomal circular DNA	*(Delhi)For Visually Impaired*
91	*Assertion (A) :* Single-stranded portions of RNA are known as sticky ends. *Reason (R) :* DNA fragments with the same kind of sticky ends can be joined together using ligases. **Appropriate option:**(D) Assertion (A) is false, but Reason (R) is true.	*(Delhi)For Visually Impaired*
92	. Amplification of gene of interest by using DNA polymerase may go upto (A) 0.1 million times (B) 1 million times	*Delhi(Main Exam*)

	(C) 1 billion times (D) 1 trillion times **Appropriate option:**(C) /1 billion times	
93	Assertion (A): A bioreactor provides the optimal conditions for achieving the desired product by providing optimum growth conditions. Reason (R) : The most commonly used bioreactors are of stirring type. **Appropriate option:**(B) Both Assertion (A) and Reason (R) are true, but Reason(R) is ***not*** the correct explanation of the Assertion (A)	*Delhi(Main Exam)*
94	 Identify the material that helps in the precipitation of purified DNA during the process of isolation of DNA as shown in the given diagram. (A) Protease (B) Lysozyme (C) Cellulase (D) Chilled ethanol **Appropriate option:**(D)/ Chilled ethanol	*Delhi(Comptt.)*
95	What is the process of binding a primer to the denatured strand called ?  (A) Denaturation (B) Annealing (C) Renaturation (D) Polymerisation **Appropriate option:**(B)/ Annealing	*Delhi(Comptt.)*

96	Assertion (A): In bioreactors, raw materials are biologically converted into desired products. Reason (R): In bioreactors, optimum growth conditions for microbes such as temperature, pH, substrate, salts, etc. are available. **Appropriate option:**(A) Both Assertion (A) and Reason (R) are true and Reason(R) is the correct explanation of the Assertion (A).	*Delhi(Compt.)*
Q. No.	**SECTION-(B)-2 MARKS QUESTIONS**	
97.	State use of bioreactors? Name a commonly used bioreactor? **SUGGESTIVE VALUE POINTS:** Bioreactors are used for processing large volume of culture for obtaining the desired product in large quantities/ In Bioreactor the raw materials are biologically converted into specific product. Commonly used Bioreactor - Stirring type bioreactor	*(Delhi)For Visually Impaired*
98.	Describe in brief any two techniques that can be utilised to transfer recombinant DNA into the host cell directly without using any vector. **SUGGESTIVE VALUE POINTS:**Micro-injection, Recombinant DNA is directly injected into the nucleus of an animal / Biolistics or gene gun, plants cells are bombarded with high velocity micro- particles of gold or tungsten coated with DNA / Heat shock, Recombinant DNA can then be forced into such cells by incubating 1/2 - the cells with recombinant DNA on ice which is followed by placing them briefly at 42 deg * C (heat shock) and then putting them back on ice	*Delhi(Main Exam*)
99.	a) Write the palindromic nucleotide sequence for following sequence of DNA segment: 5'-GAATTC-3' (b) Name the restriction endonuclease that recognizes this sequence. (c) How are sticky ends produced? Mention their role.	*Delhi(Main Exam*)

	(a) 3' – CTTAAG – 5' (b) EcoRI (c) ◆ Restriction enzyme cuts the strand of DNA between the same two bases on the opposite strands. This leaves single stranded portion or overhanging stretches at the two ends known as sticky ends.  ◆ **Role of sticky ends :** Sticky ends forms hydrogen bond with their complementary cut counter part/ /they help in joining of vector DNA and foreign DNA during rDNA technology/ stickiness of ends facilitates the action of the enzyme DNA ligase **SUGGESTIVE VALUE POINTS:(above)**	
	SECTION-(C)-3 MARKS QUESTION	
100.	Explain the basis on which gel electrophoresis technique works. Write any two ways the products obtained through this technique can be utilised. **SUGGESTIVE VALUE POINTS:** **Basis of Gel Electrophoresis** ● Gel electrophoresis works on the principle that **charged molecules move in an electric field**. ● DNA, RNA, and proteins carry charges (DNA/RNA are negatively charged due to phosphate groups). ● When placed in a gel (usually agarose or polyacrylamide) and subjected to an electric current: ○ Molecules migrate towards the **opposite electrode** (DNA/RNA → towards the positive electrode). ○ **Separation occurs based on size and charge**: ■ Smaller fragments move faster and travel farther through the gel pores.	*Delhi(Main Exam)*

	■ Larger fragments move slower and remain closer to the starting point. **Two Uses of Products Obtained** 1. **DNA Fingerprinting / Forensic Analysis** ○ Separated DNA fragments can be compared between individuals for identity testing, paternity cases, or crime investigations. 2. **Gene Cloning / Molecular Biology Research** ○ Specific DNA fragments isolated from the gel can be cut out and used for cloning, sequencing, or further genetic manipulation.	
101.	A vector is genetically engineered with three features which facilitate gene-cloning within the host cell. List the three features and explain each one of them. **SUGGESTIVE VALUE POINTS:**Features of cloning vectors -Origin of Replication (Ori):This is the sequence of DNA from where replication starts /Any piece of foreign DNA linked to it is made to replicate within host cell / it also decides the copy number of the linked DNA. -Selectable marker:helps in identifying and eliminating non-transformants and selectively permitting the growth of the transformants/ help in selection of recombinants -Cloning sites:The vector should have a few preferably single recognition site to link the foreign DNA/The ligation of alien DNA is carried out at a restriction site present in one of the two antibiotic resistance genes	*Delhi(Comptt.)*
102	Given below is the diagram representing the observation made for separating DNA fragments by gel electrophoresis. Observe the illustration and answer the questions that follow :  (a) DNA fragments move in the direction A→B. Explain. (b) Name the matrix used and its role in gel electrophoresis. (c) Mention how the separated fragments can be visualized for further technical use.	*Delhi(Comptt.)*

	SUGGESTIVE VALUE POINTS:(a) DNA being negatively charged molecule (present at A end) gets attracted towards positive electrode or anode (B end) (b) Agarose gel, the DNA fragments separate according to their size through sieving effect provided by the agarose gel (c) The separated DNA fragments can be visualised by staining them with ethidium bromide under UV radiation	

LESSON-10-APPLICATIONS OF BIOTECHNOLOGY

Q. N.	SECTION-(A)-1 MARK QUESTION	CBSE 2025
103	RNA interference (RNAi) helps in making tobacco-plant resistant to a nematode (*Meloidegyne incognitia*) Choose the correct option that shows how RNAi is achieved: (A) Preventing the process of translation of mRNA of the nematode. (B) Preventing the process of replication of DNA of the nematode. (C) Preventing the process of transcription of DNA of the plant. (D) Preventing the process of replication of DNA of the plant. **Appropriate option:**(A)/ Preventing the process of translation of mRNA of the nematode.	*Delhi(Main Exam*)
104	GEAC stands for (A) Genome Engineering Action Committee (B) Ground Environment Action Committee (C) Genetic and Environment Approval Committee (D) Genetic Engineering Approval Committee **Appropriate option:**(D) /Genetic Engineering Approval Committee	*Delhi(Main Exam*)
105	Golden rice is a promising transgenic crop. When released for cultivation, it will help in:	*Delhi(Compt.)*

	(A) Producing a petrol-like fuel from rice (B) Enrichment of Vitamin A (C) Pest resistance (D) Herbicide tolerance **Appropriate option:**(B) /Enrichment of Vitamin A	
Q. No.	**SECTION-(B)-2 MARKS QUESTION**	
106	A patient with ADA deficiency requires periodic infusion of genetically engineered lymphocytes. Explain why such periodic infusion is required and also suggest a permanent cure for such ADA deficiency. **SUGGESTIVE VALUE POINTS:**The genetically engineered lymphocytes have a life span because these cells are not immortal hence, the patient requires periodic infusion.There could be permanent cure if the gene isolated from bone marrow cells producing ADA is introduced into cells (lymphocytes) at early embryonic stages.	*Delhi(Main Exam*)
	SECTION-(C)-3 MARKS QUESTION	
107	Mention a method that can detect a pathogen at very low concentrations even when symptoms are not visible. Which two diseases are detected by this method ? **SUGGESTIVE VALUE POINTS:**Polymerase Chain Reaction / PCR To detect HIV/AIDS, to detect cancers, to detect genetic disorders, to detect covid-virus	*(Delhi)For Visually Impaired*
108	Biotechnology has helped farmers to get pest-resistant cotton crops. Explain the technique adopted along with its mode of action. **SUGGESTIVE VALUE POINTS:**The genes encoding the Bt toxin (cry I Ac and cry II Ab) have been isolated from the bacterium *Bacillus thuringiensis*, incorporated into the cotton plants using vector *(Agrobacterium tumefaciens)* The Bt gene code for the insecticidal crystal protein which exist in inactive protoxin form that is ingested by the insect pest along with the plant parts, the inactive toxin is converted into active form by the alkaline pH of the insect gut, the toxin binds to the surface of the midgut epithelial cells, in these cells it creates pores that cause lysis and swelling of the epithelial cells and cause death of the insect.	*Delhi(Compt.)*

	SECTION-(E)-5 MARKS QUESTION	
109	(a) Describe five benefits of genetically modified organisms. **OR** (b) Describe the structure of Insulin. How does maturation of Insulin occur ? What reaction can occur in a person who is given insulin from an animal source ? **SUGGESTIVE VALUE POINTS:**(a) Made crops more tolerant to abiotic stresses, reduced reliance on chemical pesticides, helped to reduce post-harvest losses, increased efficiency of mineral usage by plants, enhanced nutritional value of food, make tailor- made plants to supply alternative resources in industries (in form of starches/fuels/pharmaceuticals), for normal physiology and development, to study diseases, to get biological products, for vaccine safety, for chemical safety testing OR Insulin consists of two short polypeptide chains - A and B, that are linked by disulphide bridges. In humans insulin is synthesised as a prohormone which contains an extra stretch called C-peptide, insulin gets matured when C- peptide is removed. Allergy or reactions to foreign protein	*(Delhi)For Visually Impaired*

LESSON -11-ORGANISM AND POPULATION

Q. N.	Section-(A) -1 MARK QUESTIONS	CBSE 2025
110.	A tight one to one relation between many species of Fig tree and certain wasp is an example of a)Commensalism b)Parasitism c)Mutualism d)Amensalism **Appropriate option:**D)/Amensalism	*Outside Delhi*

111.	In asymptotic state population is a)Increasing b)Decreasing c)Stabilised d)Changing **Appropriate option:**C)Stabilised	*Outside Delhi*
Q. No.	**SECTION-(B)-2 MARKS QUESTION**	
112.	(a) Describe the population logistic growth model and provide its equation. **SUGGESTIVE VALUE POINTS:**(a) A population growing in a habitat with limited resources shows initially a lag phase, followed by phases of acceleration and deceleration and finally an asymptote when the population density reaches the carrying capacity ' K' this type of population growth is called as logistic growth curve equation dN/dt (N) = rN(K - N) / K N = population density at time t r=intrinsic rate of natural increase K = carrying capacity	*(Delhi)For Visually Impaired*
	SECTION-(C)-3 MARKS QUESTION	
113	Distinguish between predator and prey. Mention any two significant roles that predators play in nature. **SUGGESTIVE VALUE POINTS:**Predators are animal that hunt and eat other animals for food (or any other relevant explanation) whereas prey are animals that are killed and eaten by other animals. Predators act as conduits for energy transfer across trophic levels, Predators keep prey population under control, maintains species diversity by reducing the intensity of competition among competing prey species. (Any two roles)	*(Delhi)For Visually Impaired*

114	b) Name the type of interaction seen in each of following examples: (i) Ascaris worms living in the intestine of humans. (ii) Clown fish living amongst the tentacles of sea anemone. **SUGGESTIVE VALUE POINTS:**(i) Parasitism (ii) Commensalism	*Delhi(Compt.)*
	SECTION-(D)-4 MARKS QUESTION	
115	Read the following passage and answer the questions that follow : In nature, we rarely find isolated, single individuals of any species; The majority of them live in groups in a well-defined geographical area, share or compete for similar resources, potentially interbreed and thus constitute a population. The population has certain attributes whereas, an individual organism does not. A population at a given time is composed of individuals of different ages. The size of the population tells us a lot about its status in the habitat. Whatever ecological processes we wish to investigate in a population, be it the outcome of competition with another species, the impact of the predator or the effect of pesticide application, we always evaluate in terms of any change in the population size. The size, in nature, could be low or go into millions. Population size, technically called population density (N) need not necessarily be measured in numbers only. The size of a population for any species is not a static parameter. It keeps on changing with time depending on various factors including food availability, predation pressure and adverse weather. (a) The Monarch butterfly is highly distasteful to its predator because of a special chemical present in its body. How does the butterfly acquire this chemical? (b) If population density at a time t + 1 is 800, Emigration = 100, Immigration = 200, Natality = 200 and Mortality = 150, calculate the population density at time t and comment upon the type of age pyramid that will be formed in this case. Student to attempt either sub-part (c) or (d): (c) What is the difference in a method of measuring population density in an area if there are 200 carrot grass plants to only single huge banyan tree ? OR (d) Name two methods to measure the population density of tigers. **SUGGESTIVE VALUE POINTS:**(a) The butterfly acquires this chemical during its caterpillar stage by feeding on a poisonous weed.	*Delhi(Main Exam)*

	(b) Nt+1=Nt+ [(B + I) - (D + E)], 800=Nt+ [(200+200)-(150+100)] 800Nt+ (400-250) 800Nt+150 Nt800-150 = 650 Comment-As the population density is increasing with time so age pyramid would be of expanding population. (c) Single huge banyan tree - measured in terms of biomass or percent cover,carrot grass- measured in terms of percent cover OR (d) pug marks, faecal pellets	
	SECTION(E)-5 MARKS QUESTION	
116	(i) If the population density (N) at a particular time (t) is 500, what would the population density be at another specified time (t + 1) with the following data ? Natality = 100 Mortality = 50 Immigration = 300 Emigration = 250 (ii) Differentiate between *in situ* conservation and *ex situ* conservation. **SUGGESTIVE VALUE POINTS:**i) Population Density Nt+1 = Nt + [(B+I) - (D + E)] = 500+ [(100+300)-(50+250)] = 500 + 100 Thus Nt+1 = 600 In Situ Conservation - Conservation of species in their natural habitats. - Examples: National parks, wildlife sanctuaries, biosphere reserves. - Pros: Preserves ecosystem processes and evolutionary processes. - Cons: Requires large areas, can be challenging to manage. Ex Situ Conservation - Conservation of species outside their natural habitats. - Examples: Zoos, botanical gardens, seed banks, gene banks.	*(Delhi)For Visually Impaired*

	- Pros: Provides a controlled environment, can be used for breeding programs. - Cons: Limited genetic diversity, requires careful management.	

LESSON-12-ECOSYSTEM

Q. N.	SECTION (A)-1 MARK QUESTION	CBSE 2025
117.	The process of mineralization by microorganisms help in the release of: (A) inorganic nutrients from humus (B) both organic and inorganic nutrients from detritus. (C) organic nutrients from humus. (D) inorganic nutrients from detritus and formation of humus **Appropriate option:**(A) /inorganic nutrients from humus	*Delhi(Main Exam*)
118.	Mohit performed an analysis of two different soil samples from two areas A and B. He recorded these results: Soil Sample A: Lignin 40%, Sugar 10%, Chitin 45%, Nitrogen 5% Soil Sample B: Lignin 5%, Sugar 35%, Chitin 15%, Nitrogen 45% Which of these is true about their rate of decomposition in both the soil? (A) Soil A has a slower rate of decomposition than Soil B. (B) Soil A has a faster rate of decomposition than Soil B. (C) Both have the same rate of decomposition. (D) No decomposition occurs in A and B. **Appropriate option:**A) /Soil A has a slower rate of decomposition than Soil B.	*Delhi(Main Exam*)
119	What type of ecological pyramid would be obtained with the following data? Primary producer = 10 g Secondary consumer = 120 g	*Delhi(Main Exam*)

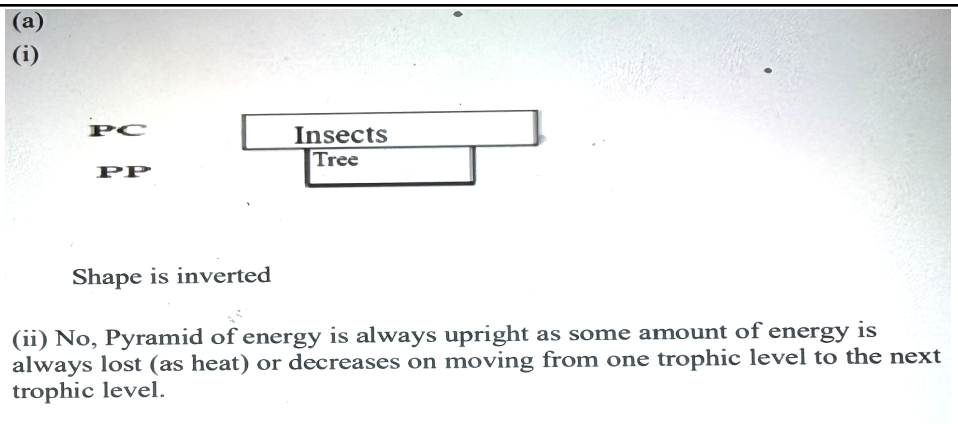
	Primary consumer = 60 g (A) Upright pyramid of biomass (B) Upright pyramid of number (C) Inverted pyramid of biomass (D) Upright pyramid of energy **Appropriate option:**(C) /Inverted pyramid of biomass	
Q. No.	**SECTION-(B)-2 MARKS QUESTION**	
120	b) Explain this process of decomposition of detritus till the formation of humus. **SUGGESTIVE VALUE POINTS: The decomposition of detritus (dead plant and animal matter) into humus involves several steps: fragmentation, leaching, catabolism, humification, and mineralization. These processes, driven by microbes and detritivores, gradually transform complex organic matter into a stable, dark, nutrient-rich substance called humus**	*Delhi(Main Exam*)
121	(A) Analyse the following ecosystems and discuss, which will be more productive in terms of primary productivity: A young forest, a natural old forest, a shallow polluted lake. OR (B) Differentiate between Net primary productivity and Gross primary productivity in an ecosystem. **SUGGESTIVE VALUE POINTS:**Young Forest Productivity is moderate.Trees are still growing, canopy is developing, and biomass accumulation is ongoing.Photosynthesis is active, but not at its peak yet. ● Natural Old Forest:Productivity is highest.Dense canopy, mature trees, and well-established nutrient cycles.Maximum photosynthetic activity and biomass storage.Rich biodiversity supports efficient nutrient recycling. ● Shallow Polluted Lake:Productivity is low.Pollution reduces oxygen levels, harms aquatic plants and phytoplankton.Eutrophication may cause algal blooms, but these are unstable and not sustainable for long-term productivity. Conclusion: Among the three, the natural old forest will be the most productive in terms of primary productivity **OR**	*Delhi(Main Exam*)

Aspect	Gross Primary Productivity (GPP)	Net Primary Productivity (NPP)
Definition	Total rate of photosynthesis (total energy fixed by plants).	Energy available to consumers after plant respiration.
Formula	GPP = NPP + Respiration (R)	NPP = GPP – Respiration (R)
Represents	Entire energy captured from sunlight.	Usable energy stored as biomass.
Example	A forest captures 100 units of energy (GPP).	After using 40 units for respiration, 60 units remain as NPP.

In short:

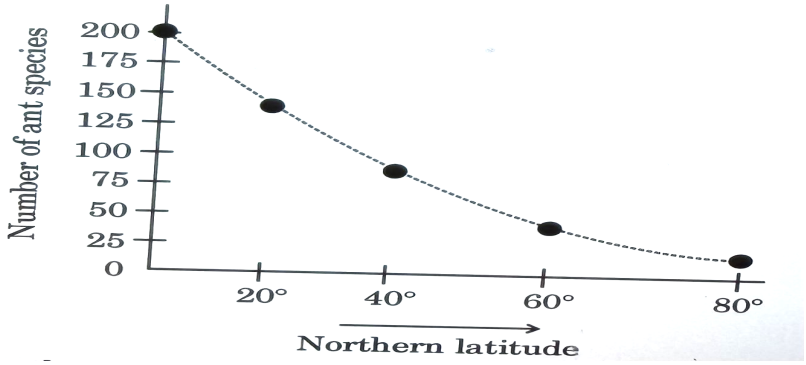
- GPP = total energy fixed.
- NPP = energy available for growth

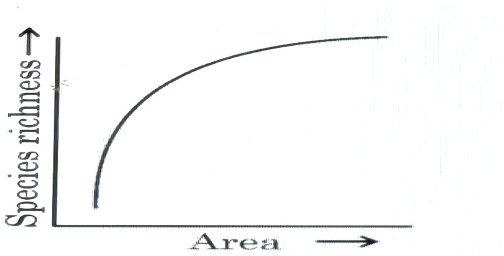
122	(i) Draw a pyramid of numbers where a large number of insects are feeding on the leaves of a tree. What is the shape of this pyramid? (ii) Will the pyramid of energy also be of the same shape in this situation? Give reason for your response. **SUGGESTIVE VALUE POINTS:**	*Delhi(Comptt.)*

	(a) (i)  Shape is inverted (ii) No, Pyramid of energy is always upright as some amount of energy is always lost (as heat) or decreases on moving from one trophic level to the next trophic level.	

LESSON-13-BIODIVERSITY AND CONSERVATION

Q. N.	SECTION -(A)-I MARK QUESTION	CBSE 2025
123	Assertion (A): Competition is a type of interspecific interaction between two or more species when the resources necessary for them are limited and adversely affect them. Reason (R): Special adaptation may allow the competing species to coexist in the same geographical area **Appropriate option:**(B) Both Assertion (A) and Reason (R) are true, but Reason(R) is ***not*** the correct explanation of the Assertion (A)	*Delhi(Comptt.)*
Q. No.	**SECTION-(B)-2 MARKS QUESTION**	
124	(a) Indiscriminate human activities such as alien species invasion, fragmentation and habitat loss have accelerated the loss of biodiversity. Justify by taking one example for each. (b) State the importance of the following: (i) IUCN Red data list (ii) Hot spots in conservation of biodiversity **SUGGESTIVE VALUE POINTS:** (a) Alien species invasion - Nile perch introduced in Lake Victoria in East Africa led to extinction of 200 species of cichlid fish / Threat posed to our native species by	*Delhi(Main Exam*)

	invasive weed species like carrot grass (Parthenium) or Lantana or water hyacinth (Eicchornia) / Illegal introduction of the African catfish Clarias gariepinus for aquaculture is posing a threat to the indigenous catfish/ any other relevant example Habitat loss and fragmentation -When large habitats are broken up into small fragments due to various human activities, mammals and birds requiring large territory habits are badly affected leading to population decline / Amazon rain forest harbouring probably millions of species is being cut and cleared for cultivation of soya bean or conversion of grassland for raising of cattle / any other relevant example (b) (i) IUCN Red data list - Provides information about species under the threat of extinction /is to identify and protect species facing a high risk of extiction/crucial for conservation planning (ii) Hot spots - have very high levels of species richness and high degree of endemism	
	SECTION-(D)4 MARKS QUESTION	
125	Biodiversity shows latitudinal and altitudinal gradients. There is little biodiversity at poles. It increases in temperate areas but reaches the maximum in tropics (latitudinal range of 23.5 deg * N to 23.5 deg). It is because the tropical rainforests have favourable environmental conditions not only for speciation, but also for supporting both variety and number of organisms. Harsh conditions exist in temperate areas during the cold season only. Number of vascular species is 118 - 236/0 * 1 ha in tropical forests and 2148 species/0-1 ha in temperate forests. Their number would be 0-0 10-0 species/0-1 ha in arctic regions. Such a correlation occurs also in case of other taxonomic groups like ants, butterflies, birds, etc.  Based on the above information and graph, answer the following questions: (a) What does the graph depict? (b) With the help of graph, show the species-area relationship for a wide variety of taxa in a forest. Write an equation that shows this relationship on a logarithm scale.(c) (i) Explain the correlation between latitudinal gradient and number of plant species.	*Delhi(Comptt.)*

	OR(c) (ii) Tropics are considered to be more stable where species continue to flourish and evolve undisturbed for millions of years. Give any two reasons. **SUGGESTIVE VALUE POINT:** a)Graph represents that as the latitude increases from 0° N to 80°N the number of ant species decreases from 200 to 25 species/latitudinal gradient of biodiversity/ tropical regions have higher biodiversity than temperate regions  (b) Equation :- log S = log C + Z log A S = Species richness; Z = Slope of the line, CY-intercept (c) (i)-Plant species number is highest at the low latitudes and decreases towards the poles - there is little biodiversity at poles though it increases in temperate areas but reaches the maximum in tropics - Number of plant species are 118-236/0.1 ha in tropical forest and decreases to 21-48 species/ 0.1 ha in temperate forest and further very low 0.0-10 species/0.1 ha in arctic regions	
	SECTION-(E)-5 MARKS QUESTION	
126	(a) (i) Explain with an example how mutualistic interaction involves co-evolution. (ii) What is endemism ? Name any two hotspots found in India. **SUGGESTIVE VALUE POINT:** **(a) (i) Mutualistic interaction and co-evolution** ● **Mutualism**: An interaction where both species benefit. ● **Co-evolution**: When two interacting species exert selective pressures on each other, leading to reciprocal adaptations. ● **Example**:**Pollination in plants and insects**:	*(Delhi)For Visually Impaired*

	■ Plants evolve specific flower shapes, colors, and nectar to attract particular pollinators. ■ Pollinators (like bees, butterflies, or birds) evolve specialized mouthparts or behaviors to access nectar efficiently. ■ This reciprocal adaptation ensures successful pollination for the plant and food for the pollinator. **(a) (ii) Endemism and hotspots in India-Endemism**: Ecological state where species are **restricted to a particular geographic region** and found nowhere else in the world. ● **Hotspots in India (any two)**: 1. Indo-Burma region (North-East India including Andam**an &** Nicobar Islands) 2. Himalaya (entire Indian Himalayan region and Indo-Burma ranges)	
127	Explain the importance of biodiversity conservation? **SUGGESTIVE VALUE POINT:** **Importance of Biodiversity Conservation** ● **Ecological Balance** ○ Biodiversity ensures the stability of ecosystems. Each species plays a role—pollinators aid plant reproduction, predators regulate prey populations, and decomposers recycle nutrients. ○ Loss of biodiversity disrupts these interactions, leading to ecosystem collapse. ● **Ecosystem Services** ○ Healthy ecosystems provide **oxygen, clean water, fertile soil, and pollination**. ○ Forests regulate climate, wetlands filter water, and oceans absorb carbon dioxide. These services are irreplaceable and directly linked to biodiversity. ● **Economic Value** ○ Biodiversity supports agriculture, fisheries, forestry, and tourism. ○ Many industries depend on genetic diversity—for example, crop breeding for disease resistance and pharmaceuticals derived from plants and microbes. ● **Medicinal Resources** ○ Over **50% of modern medicines** are derived from natural sources. Conserving biodiversity ensures access to undiscovered cures and treatments. ● **Climate Regulation** ○ Diverse ecosystems act as carbon sinks, mitigating global warming. ○ Deforestation and species loss accelerate climate change, making conservation critical for climate stability. ● **Ethical Responsibility**	*Delhi(Mai n Exam*)

	○ Humans	
128	(i) Explain, giving three reasons, why tropics show the greatest level of species diversity. (ii) List four causes of biodiversity loss. **SUGGESTIVE VALUE POINT:** **(i) Reasons why tropics show greatest species diversity** 1. **Stable Climate**: Tropics have relatively constant and favourable climatic conditions throughout the year, reducing extinction risk. 2. **Long Evolutionary Time**: Tropical regions have remained undisturbed by glaciations, allowing species to diversify over millions of years. 3. **High Productivity**: Intense sunlight and rainfall support lush vegetation, leading to more niches and greater food availability, which sustains diverse organisms. **(ii) Causes of biodiversity loss** 1. **Habitat loss and fragmentation** (e.g., deforestation, urbanisation). 2. **Over-exploitation** (e.g., overfishing, hunting, logging). 3. **Invasive species** (non-native organisms outcompeting native species). 4. **Climate change and pollution**	*(Delhi)For Visually Impaired*