

COMMON PRE-BOARD EXAMINATION -2023

BIOLOGY THEORY (044)

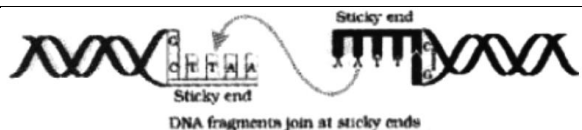
ANSWER KEY

MAX.MARKS: 70

CLASS: XII

TIME: 3 HOURS

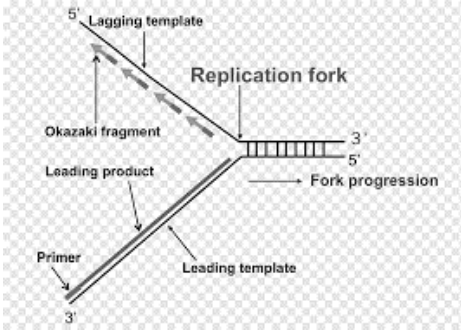
	<u>SECTION A</u>	
1	b) 250 tall plants, 500 intermediate plants, and 250 small plants	1
2	c) Convergent evolution	1
3	c) (A)-(iii), (B)-(iv), (C)-(i), (D)-(ii)	1
4	a) ff	1
5	b)	1
6	d) a sterile human male.	1
7	b) It lowers the sperm motility.	1
8	a) Species Q is a predator of species P.	1
9	b) primary settling tank	1
10	d) 4	1
11	d) bacterium producing large quantities of carbon dioxide	1
12	d) It separated the DNA with nitrogen isotopes based on densities.	1
13	b) Both A and R are true and R is not the correct explanation of A.	1
14	a) Both A and R are true and R is the correct explanation of A.	1
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	<u>SECTION B</u>	
17	<p>a) They used two types of culture media, containing ^{35}S and ^{32}P, so as to compare that which one out of DNA and proteins gets transferred from virus to bacteria and act as genetic material. 1 mark</p> <p>b) A blender and centrifuge were used to open up the bacterial cells and viral particles, so, that genetic material could be visualized. ½ mark</p> <p>c) They concluded that DNA is the genetic material that is passed from virus to bacteria. ½ mark</p>	
18	<p>a) Recombinant DNA technology</p> <p>b) Eco- R-I</p> <p>c) Palindromic sequence</p> <p>d)</p>	½ X 4



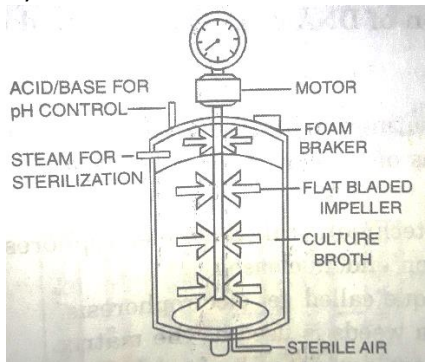
OR

- a) Cry II Ab **control the cotton bollworms** while that of Cry I Ab controls corn borer. ($\frac{1}{2} + \frac{1}{2}$) mark
 b) Bacterium Bacillus thuringiensis. ($\frac{1}{2}$) mark
 c) Cry protein (crystal protein) is a toxin coded by a gene cry and is poisonous to some insects, thus giving resistant characters to the plants. ($\frac{1}{2}$) mark

19	a) Birth rate = 10 /1000 person per year. = 0.01 offspring per b) In the month of June, there might be a lot of immigration from different areas or there might be more babies are born/expected randomly in some months of the year. In the month of July, there might be a lot of emigrations or mortalities.	1+1									
20	(a) The given pedigree chart is showing inheritance of a recessive trait. (b) This trait is autosomal. (c) Generation I \rightarrow Aa and Aa Generation II \rightarrow Third child - aa Fourth child - Aa	$\frac{1}{2} \times 4$									
21	(i) Hallucination ($\frac{1}{2}$) (ii) LSD, cocaine ($\frac{1}{2} + \frac{1}{2}$) (iii) Erythroxylum coca / Atropa belladonna / Datura sps ($\frac{1}{2}$)										
<u>SECTION C</u>											
22	a) <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th><th>Contraceptive pills</th><th>Surgical method</th></tr> </thead> <tbody> <tr> <td>Merits</td><td> <ul style="list-style-type: none"> Pills are effective with lesser side effects and well accepted by females. Reversible method </td><td> <ul style="list-style-type: none"> Surgical intervention block gamete transport. Highly effective </td></tr> <tr> <td>Demerits</td><td> <ul style="list-style-type: none"> If not taken on right days they can promote conception. Can have side effects if taken for a long time. </td><td> <ul style="list-style-type: none"> Not Reversible Can affect health of a person if performed in unhygienic condition </td></tr> </tbody> </table> b) Mode of action of IUDs (any two) (i) Increase phagocytosis of sperms within the uterus. (ii) Cu^{++} released suppress sperms motility/fertility capacity of sperm. (iii) Hormone releasing IUDs make uterus unsuitable for implantation / cervix hostile to the sperms.		Contraceptive pills	Surgical method	Merits	<ul style="list-style-type: none"> Pills are effective with lesser side effects and well accepted by females. Reversible method 	<ul style="list-style-type: none"> Surgical intervention block gamete transport. Highly effective 	Demerits	<ul style="list-style-type: none"> If not taken on right days they can promote conception. Can have side effects if taken for a long time. 	<ul style="list-style-type: none"> Not Reversible Can affect health of a person if performed in unhygienic condition 	2+1
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23	A. Physiological barrier. B. Acid in Stomach/Saliva in mouth/Tears.	$\frac{1}{2} \times 6$									

	<p>C. Cellular Barrier. D. Phagocytose / Destroy microbes. E. Interferons. F. Protect non-infected cells from virus attack</p>	
24	<p>When DDT was first used, most of the mosquitoes were sensitive to it and were therefore killed.</p> <ul style="list-style-type: none"> • In the original population of mosquitoes, some individuals were resistant to DDT. • They did not have any advantage over the DDT sensitive mosquitoes, in the absence of - DDT. • They survived in the presence of DDT and reproduced the offspring were also mostly DDT resistant. • As a result, over a period of time almost the entire population came to consist of the resistant type. (Any related answer) 2 marks <p>Name of this type of natural selection. - anthropogenic action (1)</p> <p style="text-align: center;">OR</p> <p>a)</p>  <p style="text-align: right;">(2 marks)</p> <p>(b) The source of energy for replicate of DNA is Deoxy nucleotide triphosphate, which acts as substrate and provide energy. (½) The enzymes involved in this are DNA polymerase, helicase and DNA ligase. (½)</p>	
25	<p>a) Tobacco has the following harmful effects on the body: (Any related answer) ½x4 marks</p> <ol style="list-style-type: none"> (1) Chewing tobacco can cause mouth cancer. (2) Tobacco has nicotine which increases blood pressure. (3) Smoking tobacco increases carbon monoxide concentration in body. This can lead to oxygen deficiency. (4) Tobacco smoking has harmful effects on lungs and throat. <p>b) Cocain acts on the opiod receptors of the central nervous system and has a stimulating action. It thereby has a euphoric effect and also provides with a boost in energy. Due to these reasons sportspersons are susceptible to misusing it to enhance their performance. (Any related answer) 2 marks</p>	
26	<p>i. Water vapour, methane, ammonia and hydrogen, the condition of the flask was anaerobic. ii. Chemicals found in the samples drawn from 'A' - Amino acids, sugars, bases pigments, and fats. iii. Miller experiment supports chemical evolution theory i.e. the formation of organic molecules from inorganic constituents. Hence, it helps to solve a major part of the mystery of evolution.</p>	1+1+1

27	<p>a) External factors that restrict production, such as shadiness, drought, nutrient scarcity, or extremely low temperatures, cause environmental stress. (Any related answer) 1/2 mark</p> <p>b) In areas with high stress and high disturbance, plant growth is slow. High levels of stress and disturbance cannot help plants reproduce. (Any related answer) 1/2 mark</p> <p>c) 'X' type of plants are competitors that thrive in low stress and low disturbance environments and have strong competitive ability at high population densities close to the carrying capacity. Such plants grow slowly and are common in non-seasonal tropical regions with little chance of drastic environmental changes. (Any related answer) 1/2 mark</p> <p>d) 'X' type of plants are likely to be trees. 'Y' type of plants could be desert plants. 'Z' type of plants could be herbaceous plant. ($\frac{1}{2} \times 3$)</p>	
28	<p>Hypothalamus - Gonadotropin-Releasing Hormone. This acts on the pituitary hormone gland to release Gonadotropins like LH and FSH. 1/2 mark</p> <p>Pituitary Gland - Follicle stimulating hormone (FSH) and Luteinising Hormone (LH). FSH stimulates development of follicles. The LH stimulates ovulation and maintenance of corpus luteum. 1/2 mark</p> <p>Ovary - The follicles then secrete estrogen which stimulates growth of endometrium and uterus. It also helps in the development of secondary sexual characters. The tertiary follicles change into corpus luteum which secretes progesterone. It helps in the development of endometrium and facilitates implantation. 1 mark</p> <p>Pregnancy: Estrogen released by placenta. It helps in the growth of the uterus to accommodate the growing foetus. Human Chorionic Gonadotropin (HCG) gives signals to the corpus luteum to continue to release progesterone to maintain endometrium. Human Placental Lactogen (hPL) promotes growth of mammary glands. Relaxin helps in lengthening and softening of cervical muscle and is also responsible for the expansion of lower pelvic region of mother helping the baby to come out easily. 1 mark</p>	
	<u>SECTION D</u>	
29	<p>a) Elevated blood sugar levels in person Y indicate that he is suffering from diabetes mellitus. 1 mark</p> <p>b) Excretion of glucose in urine and excessive urination caused weakness in person Y. 1 mark</p> <p>c) Blood sugar level fluctuations in person X indicate that sugar level never exceeds the normal limit and sufficient secretion of insulin at required times removes any extra sugar from blood and converts it into glycogen for future use. This implies that person X is normal and healthy.</p> <p style="text-align: center;">OR</p> <p>c) Type I diabetes (disease in person 'y') or insulin dependent diabetes mellitus or juvenile diabetes is an autoimmune disorder caused by failure of beta cells to produce adequate amounts of insulin. Type II diabetes or non-insulin dependent diabetes mellitus involves failure of insulin to</p>	

	facilitate the movement of glucose into body the cells. 2 marks	
30	<p>i) RNA interference, Tobacco plant. $\frac{1}{2}+\frac{1}{2}$ marks</p> <p>ii) Meloidegyne imcognitia , Agrobacterium tumefacines vector $\frac{1}{2}+\frac{1}{2}$ marks</p> <p>iii) By using Agrobacterium vectors, nematode-specific genes were introduced into the host plants which produce both sense and antisense RNA in the host cells. These two RNAs are complementary to each other and form a double stranded RNA (ds RNA) that initiates RNAi and hence, silences the specific mRNA of the nematode.</p> <p style="text-align: center;">OR</p> <p>iii) In the case of Tobacco plant, a nematode Meloidegyne incognitia infects its roots which results in the reduction of yield. To develop a resistant variety, RNA interference (RNAi) technology is used. Using Agrobacterium vectors, nematode-specific genes were introduced into the host plant. The introduction of DNA was such that it produced both sense and anti-sense RNA in the host cells. This two RNA's being complementary to each other formed a double-stranded (dsRNA) that initiated RNAi and thus, silenced the specific mRNA of the nematode. 2 marks</p>	
31	<p>a) Bioreactor: It is a large vessel having many controls and is mainly used for: $\frac{1}{2}+1$</p> <ul style="list-style-type: none"> • processing large volumes of culture • large scale production of recombinant proteins • biologically converting raw materials into specific products <p>b)</p>  <p>(2.5 marks)</p> <p>c) In the simply stirred tank bioreactor the stirrer facilitates the even mixing and the oxygen availability throughout the process, whereas for proper mixing throughout the reactor in the case of sparged stirred-tank bioreactor the air is found to be bubbled. 1 mark</p> <p style="text-align: center;">OR</p> <p>a) Insulin was extracted earlier from the pancreas of slaughtered pigs and cattle animals Insulin obtained from these sources caused some allergy or some other reactions to the foreign protein. $\frac{1}{2}+\frac{1}{2}$ marks</p> <p>b) Steps involved in insulin production by the Eli Lilly company are as follows:</p> <ul style="list-style-type: none"> • DNA sequences corresponding to the two polypeptide, A and B-chains of insulin were 	

synthesized in vitro.

- They were introduced into plasmid DNA of E. coli.
- This bacterium was cloned under suitable conditions.
- The transgene was expressed in the form of polypeptides A and B, secreted into the medium.
- They were extracted and combined by creating disulphide bridge to form human insulin.

2 marks

c) Differences between insulin produced by rDNA and insulin produced by pancreas are as follows: **(2 marks)**

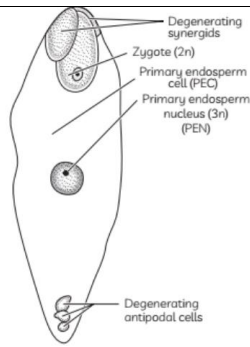
Insulin produced by rDNA	Insulin produced by the pancreas
It has A and B polypeptides.	It has three polypeptides. A, B and C-chains before maturing called the prohormone.
It directly synthesizes the mature hormone.	It undergoes processing to form mature and functional hormone.

32 a) Yes, By artificial means (any relevant explanation) $\frac{1}{2} + \frac{1}{2}$ **mark**

b) The diploid megaspore mother cell divides meiotically and forms four megaspores, which are usually arranged in a longitudinal row (linear tetrad). Out of four megaspores formed, three degenerate. The remaining one acts as functional megaspore (chalazal). The nucleus of functional megaspore undergoes three successive mitotic divisions forming eight haploid nuclei, which get organized into three groups - three nuclei migrate to the micropylar end and form the egg apparatus (one egg cell, two synergids). Three migrate towards chalazal end and form antipodal cells. Two polar nuclei fuse to form a diploid secondary nucleus in the centre. **2 marks**

c) The process of double fertilization: **2 marks**

- After entering one of the synergids, the pollen tube releases the two male gametes into the cytoplasm of the synergid.
- One of the male gametes move towards the egg cell and fuses with its nucleus thus completing the syngamy. This results in the formation of a diploid cell, i.e., the zygote.
- The other male gamete moves towards the two polar nuclei located in the central cell and fuses with them to produce a triploid primary endosperm nucleus (PEN).
- As this involves the fusion of three haploid nuclei hence, it is termed as triple fusion.
- The central cell after triple fusion becomes the primary endosperm cell (PEC) and develops into the endosperm while the zygote develops into an embryo.
- Since two types of fusions, syngamy and triple fusion take place in an embryo sac the phenomenon is termed as double fertilization

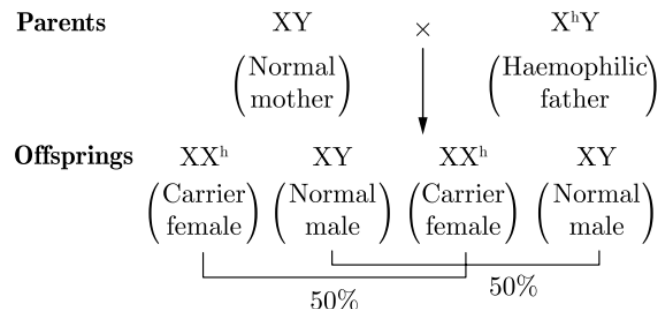


OR

- a) Zona pellucida. $\frac{1}{2}$ mark
- b) During fertilisation, a sperm comes in contact with the zona pellucida layer of the ovum which induces changes in the membrane that blocks the entry of additional sperms. **1 mark**
- c) It occurs at Ampullary Isthmus Junction. $\frac{1}{2}$ mark
- d) Repeated mitotic divisions occur in zygote and the stage with 8–16 blastomeres is called morula. **1 mark**
- e) Seminal plasma is a liquid medium which helps the sperm to move and nourishes it. **1 mark**
- f) All copulations do not lead to fertilization and pregnancy because fertilisation can only occur of the ovum and sperms are transported simultaneously to the ampullary-isthmic junction. **1 mark**

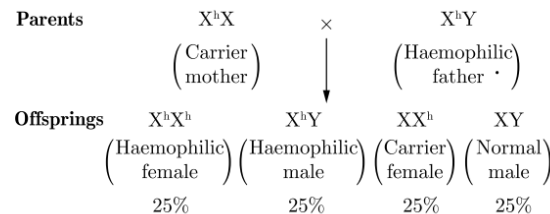
- 33 a) Haemophilia is a genetic disorder that impairs the body's ability to make blood clots, a process needed to stop bleeding. It is usually inherited with an X-linked recessive inheritance pattern. **1 mark**

(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. **1 mark**

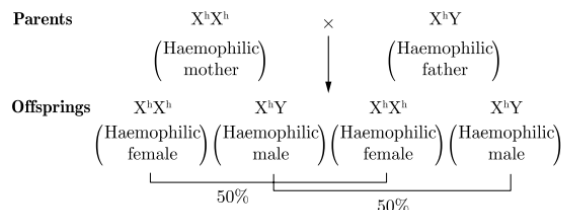
(ii) In case of carrier mother,



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

1 mark

(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.

1 mark

(c) No, there remains no fear if they married, because in x linked characters male are not carrier.

1 mark

OR

a) "I" gene-regulatory gene. Its codes for the repressor protein of the operon, which is synthesized constitutively. The repressor has the affinity for the operator gene. It binds to the operator and prevents the RNA polymerase from transcribing the structural genes. $\frac{1}{2}$ +1 mark

b) When repressor binds to the operator, the operon is switched off and transcription is stopped. So, it is called negative regulation. **1 mark**

c) Lactose is an inducer molecule. Gene 'z' codes for B-galactosidase, which is responsible for the hydrolysis of lactose into galactose and glucose. 'y' gene codes for permease. It increases the permeability of the cell to lactose. $\frac{1}{2}$ +1+1