

Series BIOकोड नं. **57/1**
Code No.**DESIGN OF QUESTION PAPER****BIOLOGY (Code - 044)****CLASS XII (2014 -15)****Time: 3 hours****Max. Marks: 70****UNIT-WISE BLUE PRINT**

Unit	Marks
1. Reproduction	14
2. Genetics and Evolution	18
3. Biology and Human Welfare	14
4. Biotechnology and its Applications	10
5. Ecology and Environment	14
Total	70

CHAPTER-WISE BLUE PRINT

Sr. No.	UNIT	VSA	SA-I	SA-II	VBQ	LA	TOTAL
1.	Reproduction	1 (1)	1 (2)	2 (6)	-	1 (5)	5 (14)
2.	Genetics and Evolution	1 (1)	1 (2)	2 (6)	1 (4)	1 (5)	6 (8)
3.	Biology and Human Welfare	1 (1)	2 (4)	3 (9)	-	-	6 (14)
4.	Biotechnology and its Applications	-	1 (2)	1 (3)	-	1 (5)	3 (10)
5.	Ecology and Environment	2 (2)	-	4 (12)	-	-	6 (14)
	TOTAL	5 (5)	5 (10)	12 (36)	1 (4)	3 (15)	26 (70)

NOTE:

1. *There is no overall choice.*
2. *However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks weightage.*

TYPOLOGY OF QUESTIONS

BIOLOGY (044)

CLASS XII (2014-15)

S. No.	Typology of Questions	Very Short Answer (VSA) (1 mark)	Short Answer-I (SA-I) (2 marks)	Short Answer-II (SA-II) (3 marks)	Value based question (4 marks)	Long Answer (LA) (5 marks)	Total Marks	% Weightage
1.	Remembering : (Knowledge based Simple recall questions, to know specific focus, terms, concepts, principles, or theories, identify define, or recite. information)	2	1	1	-	-	7	10%
2.	Understanding (Comprehension : To be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase information)	-	2	4	-	1	21	30%
3.	Application : (Use abstract information in concrete situation, to apply knowledge to new situations, use given content to interpret a situation, provide an example, or solve a problem)	-	2	4	-	1	21	30%
4.	High Order Thinking Skills (Analysis & Synthesis : Classify, compare, contrast, or differentiate between different pieces of information, organize and/or integrate unique pieces of information from a variety of sources)	2	-	1	-	1	10	14%
5.	Evaluation and Multi-Disciplinary : (Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	1	-	2	1	-	11	16%
	Total	5 × 1 = 5	5 × 2 = 10	12 × 3 = 36	4 × 1 = 4	5 × 3 = 15	70(26)	100%

Series BIO

कोड नं. **57/1**
Code No.

रोल नं.

Roll No.

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परीक्षार्थी कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें |

Candidates must write the Code on the title page of the answer-book.

- कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित-पृष्ठ 6 हैं |
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए कोड नम्बर को छात्र उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें |
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में 26 प्रश्न हैं |
- कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, प्रश्न का क्रमांक अवश्य लिखें |
- इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है | प्रश्न-पत्र का वितरण पूर्वान्ह में 10.15 बजे किया जायेगा | 10.15 बजे से 10.30 बजे तक छात्र केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे |
- Please check that this question paper contains 6 printed pages.
- Code number given on the right hand side of this question papers should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 26 questions.
- Please write down the serial number of the question paper before attempting it.
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

जीव विज्ञान (सैधांतिक)

BIOLOGY (Theory)

निर्धारित समय : 3 घण्टे

Time allowed : 3 hours

अधिकतम अंक : 70

Maximum Marks : 70

General Instructions:

1. All questions are compulsory.
 2. This question paper consists of four Sections A, B, C and D. Question number 1 to 5 in Section 'A' are of **1 mark** each, 6 to 10 in Section 'B' are of **2 marks** each, 11 to 22 in Section 'C' are of **3 marks** each question and 24 to 26 in Section 'D' are of **5 marks** each.
 3. Question number 23 is a **value based question** for **4 marks**.
 4. There is no overall choice. However, an internal choice has been provided in one question of **2 marks**, one question of **3 marks** and all the three questions of **5 marks** weightage. A student has to attempt only one of the alternatives in such questions.
 5. Wherever necessary, the diagrams drawn should be neat and properly labelled.
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SECTION A

1. What stimulates the pituitary gland to secrete hormone responsible for parturition?
Name the hormone.
2. Name the chromosomal disorder that is caused due to presence of an additional copy of X chromosome. Write the karyotype of the person suffering from this disorder.
3. What is the economic value of *Sccharum officinarum*? Give two points.
4. State *Allen's rule*.
5. What is the unit of productivity in terms of energy and weight respectively?

SECTION B

6. What is 'Saheli'? Name the institute where it was developed?
7. Write the two theories proposed by Oparin and Haldane.

OR

- a) Name the first human-like hominid. What was its brain capacity?
 - b) Name the hominid that existed about 1.5 mya. What was its brain capacity?
8. Name two organisms that cause Pneumonia. How is this disease transmitted to a healthy person? Give two points.

9. Name a, b, c and d in the following table:

Type of microbe	Scientific name	Commercial Product
Bacterium	<i>a</i>	Acetic acid
Bacterium	<i>b</i>	Butyric acid
Fungus	<i>Monascus purpureus</i>	<i>c</i>
Fungus	<i>Trichoderma polysporum</i>	<i>d</i>

10. Name the organism from where DNA polymerase used in PCR technique is obtained. State its role in genetic engineering. What is this DNA polymerase commonly called?

SECTION C

11. Explain the terms encystation and sporulation.

12. a) Identify the following figure:

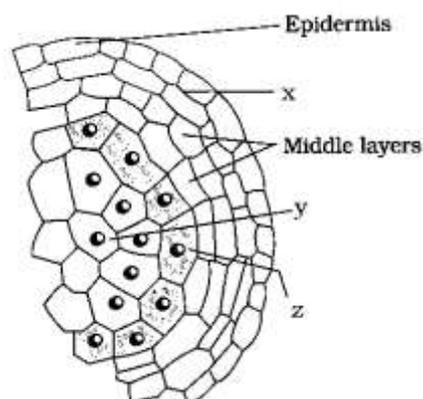


b) Name the initial structure from which this structure has developed. Also write the ploidy of the initial structure.

c) Draw and name the next mature stage and label the parts.

OR

a) Identify the following figure:

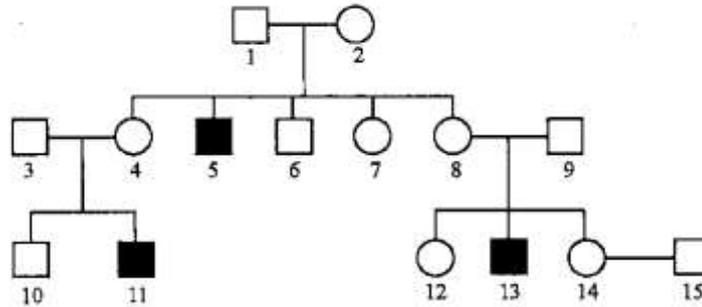


b) Name x, y and z in the above figure.

c) Mention one characteristic feature and one function of 'z' in the above figure.

13. The pedigree chart given below shows the inheritance of haemophilia in one family.

Study the pattern of inheritance and answer the questions given:



- Give all the possible genotypes of the members 4, 5 and 6 in the pedigree chart.
- A blood test shows that the individual 14 is a carrier of haemophilia. The member numbered 15 has recently married the member numbered 14. What is the probability that their first child will be a haemophilic male?

14. Draw a dinucleotide chain and label the following on it:

- Components of a nucleotide
- 5' end
- N - glycosidic linkage
- Phosphodiester linkage

15. a) Expand MALT.

- Why are lymph nodes and bone marrow called lymphoid organs? Explain the function of each of them.

16. Explain how sex is determined in honey bees. Draw a cross to support your answer.

17. a) Name the genus in which majority of the baculoviruses are present.

- How can Baculovirus be used for integrated pest management in an ecologically sensitive area? Explain giving two reasons.

- 18.** a) Mention the cause and the body system affected by ADA deficiency in humans.
- b) Name the vectors used for transferring ADA-DNA into the recipient cells in humans. Name the recipient cells.
- c) How does gene therapy help in this case?
- 19.** a) List two adaptations in Kangaroo rats that help them to survive in absence of external source of water.
- b) Explain Brood parasitism with the help of an example.
- 20.** a) Draw a simplified model of Phosphorous cycle and label all its parts.
- b) What type of biogeochemical cycle is it?
- 21.** a) Plot a graph showing species - area relationship. Also draw a log scale graph for the same.
- b) What is the range of the value of 'Z'?
- 22.** a) Explain Biomagnification.
- b) How does the biomagnification of DDT affect the population of fish eating birds?
- 23.** Ramesh and his mother, both are suffering from Thalassemia whereas his father and brother, Suresh, are both normal. The father always blames the mother for Ramesh's illness. One day, Suresh, being a biology student, explained his father the reason why Ramesh has Thalassemia and how his mother is not responsible for the same and now everything is fine.
- a) What is Thalassemia? What are its two types?
- b) Give biological reason for why the mother is not the only one responsible for Ramesh's illness? Work out a cross to support your answer.
- c) What values did Suresh show?

SECTION D

24. a) How does pollination take place in Vallisneria and Zostera?
b) Differentiate between Autogamy, Geitonogamy and Xenogamy in two points each.

OR

- a) Draw a diagram of the human female reproductive system and label on it:
i) site of fertilisation of ova
ii) three walls of uterus
iii) uterine fundus
b) Write a short note on the structure and function of mammary glands in human females.
25. a) What is sickle cell anaemia? Why is it caused?
b) What happens to the mutant haemoglobin molecule in case of low oxygen tension?
c) Work out a cross between an unaffected homozygous male and an affected homozygous female.

OR

Explain the process of translation.

26. a) With the help of diagrams show different steps involved in the formation of a recombinant DNA by action of restriction endonuclease enzyme EcoRI.
b) Name the technique that is used for separating the fragments of DNA cut by restriction endonuclease.
c) Name the substance used to stain the DNA fragments. Which colour does DNA fragments obtain on staining with this substance?

OR

- a) Name the source from which insulin was extracted earlier. Why is this insulin no longer in use by diabetic people?
b) Explain the process of synthesis of insulin by Eli Lilly Company. Name the technique used by the company.
c) How is the insulin produced by human body different from the insulin produced by the above mentioned company?
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SENIOR SCHOOL CERTIFICATE EXAMINATION

Marking Scheme - Biology (Theory)

Expected Answers / Value Points

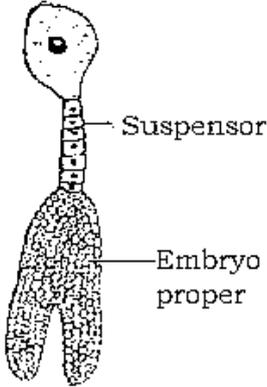
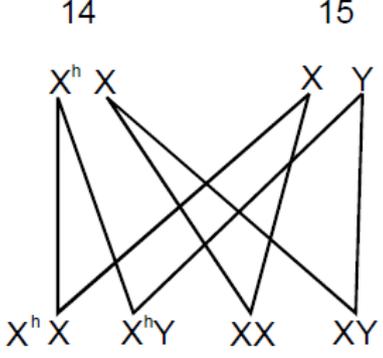
General Instructions:

The Marking Scheme and mechanics of marking

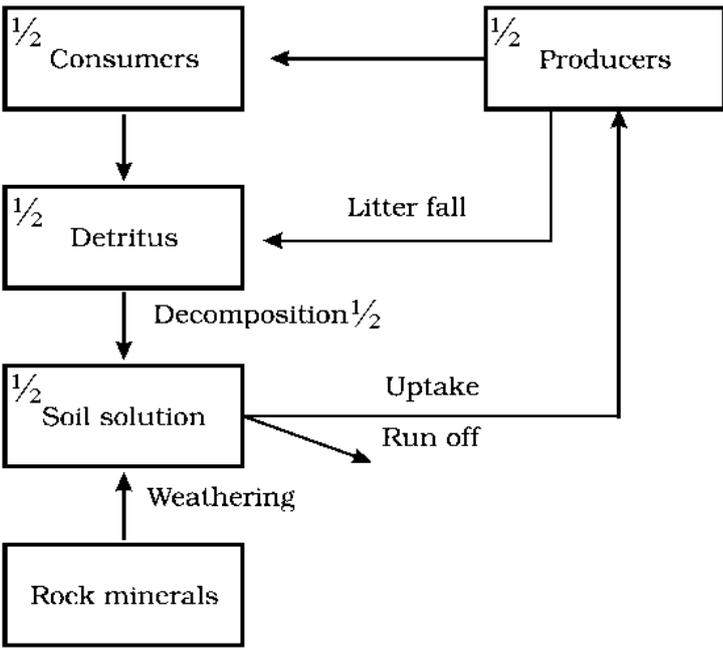
1. In the marking scheme the marking points are separated by commas, one oblique line (/) indicates acceptable alternative, two oblique (//) indicate complete acceptable alternative set of marking points.
2. Any words/phrases given within brackets do not have marks.
3. Allow spelling mistakes unless the misspelt word has another biological meaning. Ignore plurals unless otherwise stated in the marking scheme.
4. In any question exclusively on diagram no marks on any description. But in questions on descriptions, same value points may be marked on the diagrams as a substitute.
5. All awarded marks are to be written in the left hand margin at the end of the question or its part.
6. Place a tick (✓) in red directly on the key/operative term or idea provided it is in correct context. Place “Half-tick” ½ wherever there are ½ marks in the marking scheme. (Do not place tick indiscriminately just to show that you have read the answer).
7. If no marks are awarded to any part or question put a cross (×) at incorrect value portion and mark it zero (in words only).
8. Add up ticks or the half ticks for a part of the question, do the calculation if any, and write the part total or the question total in the left hand margin.
9. Add part totals of the question and write the question total at the end. Count all the ticks for the entire question as a recheck and draw a circle around the question total to confirm correct addition.
10. If parts have been attempted at different places do the totalling at the end of the part attempted last.
11. If any extra part is attempted or any question is reattempted, score out the last one and write “extra”.
12. In questions where only a certain number of items are asked evaluate only that many numbers in sequence as is asked ignoring all the extra ones even if otherwise correct.
13. Transcribe the marks on the cover page. Add up question totals. Recheck the script total by adding up circled marks in the script.
14. Points/answer given in brackets in marking scheme are not so important and may be ignored for marking.

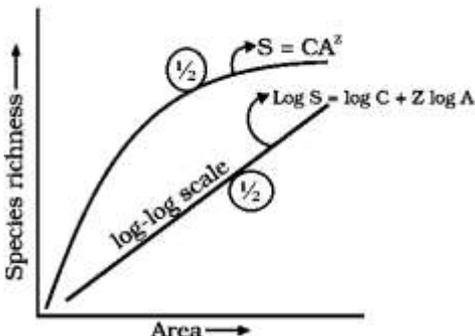
Q. No.	Expected Value point	Marks	Total
SECTION - A			
1.	Foetal ejection reflex Oxytocin	½ ½	1
2.	Klinefelter's syndrome karyotype → XXY	½ ½	1
3.	Thicker stems High sugar content	½ ½	1
4.	Mammals from colder climates generally have shorter ears and limbs to minimise heat loss	1	1
5.	Energy → [Kcal m ⁻²]yr ⁻¹ Weight → [g m ⁻²]yr ⁻¹	½ ½	1
SECTION - B			
6.	Oral contraceptive for women CDRI - Central Drug Research Institute, Lucknow	1 1	2
7.	i) The first form of life could have come from pre-existing non-living organic molecules like RNA, proteins etc. ii) Formation of life was preceded by chemical evolution that resulted in the formation of diverse organic molecules from inorganic constituents OR a) <i>Homo habilis</i> ; 650 - 800 cc b) <i>Homo erectus</i> ;900 cc	1 1 ½ + ½ ½ + ½	2 2
8.	Causal organisms: <i>Streptococcus pneumoniae</i> <i>Haemophilus influenzae</i> Transmission: Inhalation of droplets or aerosols of infected person Sharing things of infected person [or any other]	½ ½ ½ ½	2
9.	a) <i>Acetobacter aceti</i> b) <i>Clostridium butylicum</i> c) Statins d) Cyclosporin A	½ ½ ½ ½	2
10.	<i>Thermus aquaticus</i> It is a thermostable enzyme that can withstand the high temperature used in denaturation and separation of two strands of DNA; hence it can be used for number of cycles of amplification. Taq polymerase	½ ½ ½ ½	2

SECTION - C

<p>11.</p>	<p>Under unfavourable condition the <i>Amoeba</i> withdraws its pseudopodia and secretes a three-layered hard covering or cyst around itself. This phenomenon is termed as encystation. When favourable conditions return, the encysted <i>Amoeba</i> divides by multiple fission and produces many minute amoeba or pseudopodiospores; the cyst wall bursts out, and the spores are liberated in the surrounding medium to grow up into many amoebae. This phenomenon is known as sporulation.</p>	<p>1 2</p>	<p>3</p>
<p>12.</p>	<p>a) Globular embryo b) Zygote, 2n c)</p>  <p align="center">Heart-shaped embryo</p> <p align="center">OR</p> <p>a) Microsporangium b) x → endothecium y → microspore mother cell z → tapetum c) Characteristic: dense cytoplasm/multi-nucleated [<i>any one</i>] Function: nourishes the growing pollen grains</p>	<p>$\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$</p>	<p>3 3</p>
<p>13.</p>	<p>a) Possible genotypes are: 4 → XX^h 5 → X^hY X → normal 6 → XY X^h → haemophilic</p> <p>b)</p>  <p><u>25%</u> chances of haemophilic <u>male</u>.</p>	<p>$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$</p>	<p>3</p>

<p>14.</p>	<p>Diagram: Labelling:</p> <p>a) 1 b) 1/2 c) 1/2 d) 1/2</p>	<p>3</p>																																	
<p>15.</p>	<p>a) MALT: <u>Mucosa Associated Lymphoid Tissue</u> b) Since lymph nodes and bone marrow are the organs where origin and / or maturation and proliferation of lymphocytes occur, they are called lymphoid organs. <u>Function of Lymph nodes:</u> Lymph nodes serve to trap the microorganisms and other antigens that enter the lymph; the lymphocytes in the lymph are then activated by these foreign molecules/ organisms to mount an immune response. <u>Function of Bone marrow:</u> Bone marrow is the primary lymphoid organ where lymphocytes are produced.</p>	<p>1 1 1/2 1/2</p>	<p>3</p>																																
<p>16.</p>	<p>The sex determination in honey bee is based on the number of sets of chromosomes an individual receives. An offspring formed from the union of a sperm (n) and an egg(n) develops as a female (queen or worker) An unfertilised egg (n) develops as a male (drone) by means of parthenogenesis. This means that the males have half the number of chromosomes than that of a female. The females are diploid having 32 chromosomes and males are haploid, i.e., having 16 chromosomes. This is called as haplodiploid sex determination system. Cross:</p> <table border="0" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding-right: 20px;">Parent</td> <td style="text-align: center;">σ</td> <td style="text-align: center;">♀</td> <td></td> </tr> <tr> <td>No. of Chromosomes</td> <td style="text-align: center;">16</td> <td style="text-align: center;">32</td> <td></td> </tr> <tr> <td>Ploidy</td> <td style="text-align: center;">n</td> <td style="text-align: center;">2n</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">↓ mitosis</td> <td style="text-align: center;">↓ meiosis</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">(n)</td> <td style="text-align: center;">(n) (n)</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">↓</td> <td style="text-align: center;">↓ parthenogenesis</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">2n</td> <td style="text-align: center;">n</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">female</td> <td style="text-align: center;">male</td> <td></td> </tr> </table>	Parent	σ	♀		No. of Chromosomes	16	32		Ploidy	n	2n			↓ mitosis	↓ meiosis			(n)	(n) (n)			↓	↓ parthenogenesis			2n	n			female	male		<p>1/2 1/2 1/2 1/2 1</p>	<p>3</p>
Parent	σ	♀																																	
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	2n	n																																	
	female	male																																	

17.	<p><i>Nucleopolyhedrovirus</i></p> <p>These viruses are excellent candidates for species-specific, narrow spectrum insecticidal applications. They have been shown to have no negative impacts on plants, mammals, birds, fish or even on non-target insects. This is especially desirable when beneficial insects are being conserved to aid in an overall integrated pest management (IPM) programme, or when an ecologically sensitive area is being treated.</p>	<p>1 1/2 1/2 1/2</p>	3
18.	<p>a) <u>Cause</u>: deletion of gene of adenosine deaminase <u>Body system affected</u>: Immune system</p> <p>b) <u>Vector</u>: retrovirus <u>Recipient</u>: Lymphocytes</p> <p>c) A functional ADA cDNA is introduced into these lymphocytes, which are subsequently returned to the patient. When such lymphocytes return to the blood, they are able to synthesise ADA and the disorder is cured. If this procedure is done in early embryonic stage then it becomes a permanent cure.</p>	<p>1/2 1/2 1/2 1/2 1/2</p>	3
19.	<p><u>Adaptations</u>:</p> <p>Internal fat oxidation (in which water is a by-product) It also has the ability to concentrate its urine so that minimal volume of water</p> <p><u>Brood Parasitism</u>: Parasitism seen in birds wherein the parasitic bird lays its eggs in the nest of a host bird and lets the host incubate them. During the course of evolution, the eggs of the parasitic bird have evolved to resemble the host's egg in size and colour to reduce the chances of the host bird detecting the foreign eggs and ejecting them from the nest. eg: Cuckoo lays its eggs in the nest of a crow</p>	<p>1/2 1/2 1/2 1 1/2</p>	3
20.	<p>a)</p>  <pre> graph TD P["1/2 Producers"] --> C["1/2 Consumers"] C --> D["1/2 Detritus"] P -- "Litter fall" --> D D -- "Decomposition 1/2" --> S["1/2 Soil solution"] R["Rock minerals"] -- "Weathering" --> S S -- "Uptake" --> P S -- "Run off" --> R </pre> <p>b) Sedimentary cycle</p>	<p>2 1/2 1/2</p>	3

21.	<p>a)</p>  <p>S = Species richness A = Area Z = slope of the line (regression coefficient) C = Y-intercept</p> <p><i>[any two]</i> b) Value of Z = [0.1 to 0.2]</p>	1 $\frac{1}{2} + \frac{1}{2}$ 1	3
22.	<p><u>Biomagnification:</u></p> <p>a) Biomagnification refers to increase in concentration of the toxicant at successive trophic levels. This happens because a toxic substance accumulated by an organism cannot be metabolised or excreted, and is thus passed on to the next higher trophic level.</p> <p>b) If it starts at 0.003 ppb in water, it can ultimately can reach 25 ppm in fish-eating birds, through biomagnification. High concentrations of DDT disturb calcium metabolism in birds, which causes thinning of eggshell and their premature breaking, eventually causing decline in bird populations</p>	$\frac{1}{2}$ $\frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2}$	3
23.	<p><u>Thalassemia:</u></p> <p>a) Thalassemia is an <u>autosomal-linked recessive</u> blood disease transmitted from parents to the offspring when <u>both the partners are unaffected carrier</u> for the gene (or heterozygous).</p> <p>b) <i>[Answer depends on person to person]</i> Cross:</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="323 1216 718 1563"> <p>Parent ♂ TT ♀ T^xT^x</p> <p>Genotype</p> <p>Gametes T T^x</p> <p>Fertilisation</p> <p>Progeny TT^x TT^x T^xT^x T^xT^x</p> <p style="text-align: center;">I</p> </div> <div data-bbox="734 1216 1133 1563"> <p>Parent ♂ T^xT^x ♀ T^xT^x</p> <p>Genotype</p> <p>Gametes T^x T^x</p> <p>Fertilisation</p> <p>Progeny TT^x TT^x T^xT^x T^xT^x</p> <p style="text-align: center;">II</p> </div> </div> <p>In the first cross, the father is shown to be healthy, and all the progenies are also healthy but carrier. This is not the case because Ramesh has the disease.</p> <p>In the second cross, the father is shown to be a carrier of a mutant thalassemia gene and there are 50% chances of the progeny to have the disease.</p> <p>Since the mutant gene is expressed in his son, he is a carrier of the disease.</p> <p>So the father is also responsible for Ramesh's illness.</p> <p><u>Values shown by Suresh:</u></p> <ul style="list-style-type: none"> - General awareness - Intellectual thinking <p style="text-align: right;"><i>[or any other]</i></p>	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	4

SECTION - D

24.

a) In Vallisneria, the female flowers reach the surface of water by the long stalk and the male flowers or pollen grains are released on to the surface of water. They are carried passively by water currents; some of them eventually reach the female flowers and the stigma. In Zostera, female flowers remain submerged in water and the pollen grains are released inside the water. Pollen grains in many such species are long, ribbon like and they are carried passively inside the water; some of them reach the stigma and achieve pollination.

1/2

5

b)

Autogamy	Geitonogamy	Xenogamy
Transfer of pollen grains from the anther to the stigma of the same flower	Transfer of pollen grains from the anther to the stigma of another flower of the same plant.	Transfer of pollen grains from anther to the stigma of a different plant
No genetic variations seen	No genetic variations seen	Genetic variations are seen

1/2

1/2

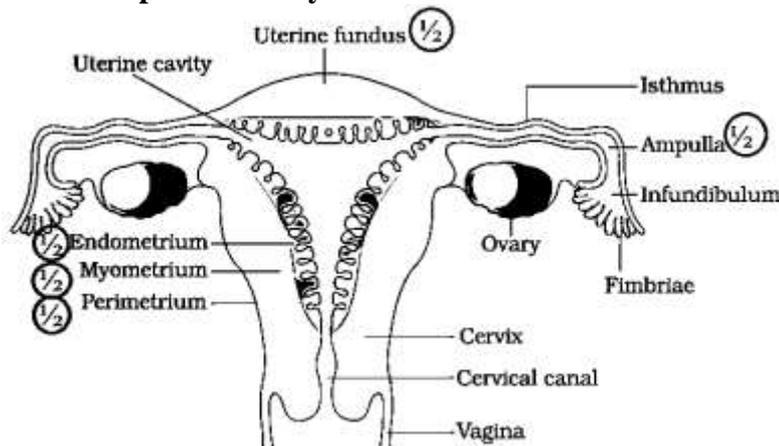
1/2

1 1/2

1 1/2

OR

a) **Female reproductive system:**



2 1/2

b) The mammary glands are paired structures (breasts) that contain glandular tissue and variable amount of fat. The glandular tissue of each breast is divided into 15-20 mammary lobes containing clusters of cells called alveoli. The cells of alveoli secrete milk, which is stored in the cavities (lumens) of alveoli. The alveoli open into mammary tubules. The tubules of each lobe join to form a mammary duct. Several mammary ducts join to form a wider mammary ampulla which is connected to lactiferous duct through which milk is sucked out.

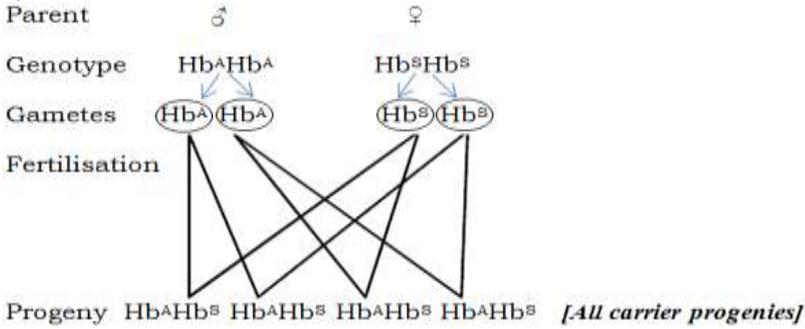
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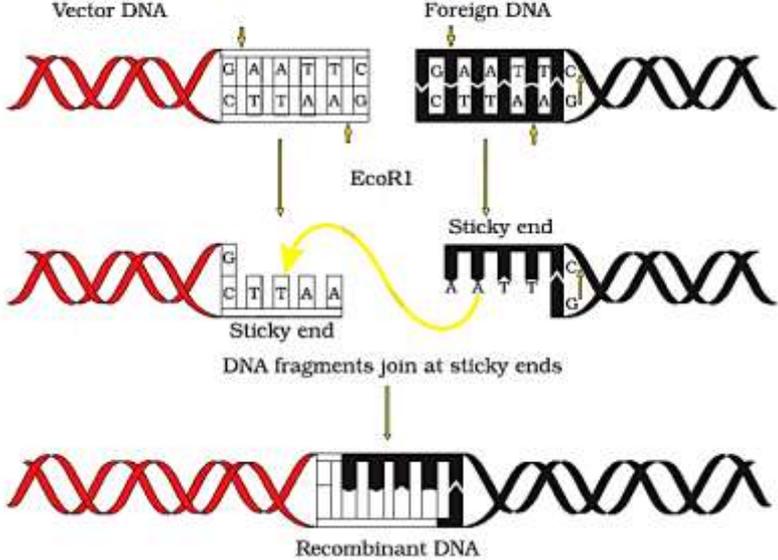
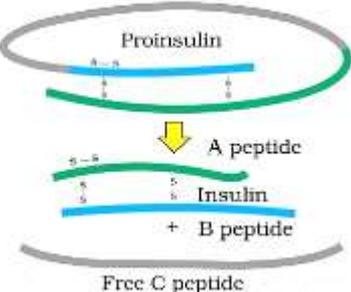
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<p>25.</p>	<p>a) This is an autosome linked recessive trait that can be transmitted from parents to the offspring when both the partners are carrier for the gene (or heterozygous). The defect is caused by the substitution of Glutamic acid (Glu) by sickle-cell anaemia Valine (Val) at the sixth position of the beta globin chain of the haemoglobin molecule. The substitution of amino acid in the globin protein results due to the single base substitution at the sixth codon of the beta globin gene from GAG to GUG.</p> <p>b) The mutant haemoglobin molecule undergoes polymerisation under low oxygen tension causing the change in the shape of the RBC from biconcave disc to elongated sickle like structure.</p> <p>c) Cross:</p>  <p>Progeny Hb^AHb^S Hb^AHb^S Hb^AHb^S Hb^AHb^S [All carrier progenies]</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>5</p>
<p>OR</p>			
	<p>a) Translation refers to the process of polymerisation of amino acids to form a protein polypeptide chain. It can be divided into the following steps:</p> <p>i) Activation of amino acid and transfer to t-RNA: In the first phase amino acids are activated in the presence of ATP and linked to their cognate t-RNA— a process commonly called as charging of tRNA or aminoacylation of t-RNA.</p> <p>ii) Transfer of cognate t-RNA to ribosome: The t-RNA and m-RNA from nucleus are transferred to the ribosome where the m-RNA binds to the smaller sub-unit(30-S)</p> <p>iii) Initiation: As the UAC anti-codon of the t-RNA matches with the first triplet code AUG of the m-RNA, the smaller subunit of ribosome joins the complex in the presence of Mg⁺². Immediately the larger subunit joins in and the t-RNA^{met} occupies the Promoter site (P site) of the larger sub-unit. Till then a new cognate t-RNA with some other amino acid (for eg. glycine) binds with the acceptor site (A site) of the larger sub-unit (50-S).</p> <p>iv) Elongation: As the m-RNA slides on the smaller subunit, t-RNA^{met} now occupies the Exit site (E site) of the larger sub-unit. At the same time the t-RNA^{gly} complex occupies the P site of the ribosome. The methionine group gets detached from the t-RNA^{met} complex and binds with the amino acid of the second cognate t-RNA (ie: glycine of the t-RNA^{gly} complex). The bond formation takes place by the reaction of -COOH of the first amino acid with the -NH₂ of the second forming a peptide bond (-CO-NH-) with the loss of water.</p>	<p>1/2</p> <p>1</p> <p>1/2</p> <p>1</p> <p>1 1/2</p>	

	<p>This step continues several times until a stop codon is reached on the m-RNA.</p> <p>v) Termination: As the stop codons do not code for any of the amino acid, the process of translation is terminated and the polypeptide chain is released.</p>	1/2	
26.	<p>a)</p> <p>The enzyme cuts both DNA strands at the same site</p> <p>EcoRI cuts the DNA between bases G and A only when the sequence GAATTC is present in the DNA</p>  <p>Vector DNA</p> <p>Foreign DNA</p> <p>EcoRI</p> <p>Sticky end</p> <p>Sticky end</p> <p>DNA fragments join at sticky ends</p> <p>Recombinant DNA</p> <p>b) Gel electrophoresis</p> <p>c) Ethidium bromide; Bright orange</p> <p>OR</p> <p>a) Insulin was extracted from the pancreas of slaughtered cattle and pig. However this insulin caused patients to develop some kind of allergy and reactions to foreign protein.</p> <p>b) Eli Lilly an American company prepared two DNA sequences corresponding to A and B, chains of human insulin and introduced them in plasmids of <i>E. coli</i> to produce insulin chains. Chains A and B were produced separately, extracted and combined by creating disulphide bonds to form human insulin.</p> <p>c) In humans, insulin is synthesised as a pro-hormone (like a pro-enzyme, the pro-hormone also needs to be processed before it becomes a fully mature and functional hormone) which contains an extra stretch called the C peptide.</p>  <p>Proinsulin</p> <p>A peptide</p> <p>Insulin</p> <p>+ B peptide</p> <p>Free C peptide</p>	<p>1</p> <p>1/2</p> <p>1</p> <p>1</p> <p>1/2</p> <p>1/2 + 1/2</p> <p>1/2</p> <p>1/2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	5