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BIOLOGY

CLASS 12

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- In each chapter, for better understanding, questions have been classified according to the typology issued by CBSE as :

R - Remembering, **U** - Understanding,

K - Knowledge, **A** - Application.

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Latest Syllabus for Academic Year 2017-18

Biology, Class-12 (Code No. 044)

Time : 3 Hours

Max. Marks : 70

Unit	Title	No. of Periods	Marks
VI	Reproduction	30	14
VII	Genetics and Evolution	40	18
VIII	Biology and Human Welfare	30	14
IX	Biotechnology and its Applications	30	10
X	Ecology and Environment	30	14
	Total	160	70

UNIT - VI: REPRODUCTION

30 periods

Chapter-1 : Reproduction in Organisms

Reproduction, a characteristic feature of all organisms for continuation of species; modes of reproduction—asexual and sexual reproduction; asexual reproduction—binary fission, sporulation, budding, gemmule formation, fragmentation; vegetative propagation in plants.

Chapter-2 : Sexual Reproduction in Flowering Plants

Flower structure; development of male and female gametophytes; pollination—types, agencies and examples; outbreeding devices; pollen-pistil interaction; double fertilization; post fertilization events—development of endosperm and embryo, development of seed and formation of fruit; special modes—apomixis, parthenocarpy, polyembryony; Significance of seed dispersal and fruit formation.

Chapter-3 : Human Reproduction

Male and female reproductive systems; microscopic anatomy of testis and ovary; gametogenesis—spermatogenesis and oogenesis; menstrual cycle; fertilisation, embryo development upto blastocyst formation, implantation; pregnancy and placenta formation (elementary idea); parturition (elementary idea); lactation (elementary idea).

Chapter-4 : Reproductive Health

Need for reproductive health and prevention of Sexually Transmitted Diseases (STDs); birth control - need and methods, contraception and medical termination of pregnancy (MTP); amniocentesis; infertility and assisted reproductive technologies - IVF, ZIFT, GIFT (elementary idea for general awareness).

UNIT - VII : GENETICS AND EVOLUTION

40 Periods

Chapter-5 : Principles of Inheritance and Variation

Heredity and variation : Mendelian inheritance; deviations from Mendelism – incomplete dominance, co-dominance, multiple alleles and inheritance of blood groups, pleiotropy; elementary idea of polygenic inheritance; chromosome theory of inheritance; chromosomes and genes; Sex determination—in humans, birds and honey bee; linkage and crossing over; sex linked inheritance—haemophilia, colour blindness; Mendelian disorders in humans - thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

Chapter-6 : Molecular Basis of Inheritance

Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; transcription, genetic code, translation; gene expression and regulation—lac operon; genome and human and rice genome projects; DNA fingerprinting.

Chapter-7: Evolution

Origin of life; biological evolution and evidences for biological evolution (paleontology, comparative anatomy, embryology and molecular evidences); Darwin's contribution, modern synthetic theory of evolution; mechanism of evolution - variation (mutation and recombination) and natural selection with examples, types of natural selection; Gene flow and genetic drift; Hardy - Weinberg's principle; adaptive radiation; human evolution.

UNIT - VIII : BIOLOGY AND HUMAN WELFARE

30 Periods

Chapter-8: Human Health and Diseases

Pathogens; parasites causing human diseases (malaria, dengue, chickengunia, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm) and their control; Basic concepts of immunology - vaccines; cancer, HIV and AIDS; Adolescence - drug and alcohol abuse.

Chapter-9: Strategies for Enhancement in Food Production

Improvement in food production : Plant breeding, tissue culture, single cell protein, Biofortification, Apiculture and Animal husbandry.

Chapter-10: Microbes in Human Welfare

In household food processing, industrial production, sewage treatment, energy generation and microbes as biocontrol agents and biofertilizers. Antibiotics; production and judicious use.

UNIT - IX : BIOTECHNOLOGY AND ITS APPLICATIONS

30 Periods

Chapter-11: Biotechnology–Principles and processes

Genetic Engineering (Recombinant DNA Technology).

Chapter-12: Biotechnology and its Application

Application of biotechnology in health and agriculture: Human insulin and vaccine production, stem cell technology, gene therapy; genetically modified organisms - Bt crops; transgenic animals; biosafety issues, bio piracy and patents.

UNIT - X : ECOLOGY AND ENVIRONMENT

30 Periods

Chapter-13: Organisms and Populations

Organisms and environment : Habitat and niche, population and ecological adaptations; population interactions–mutualism, competition, predation, parasitism; population attributes–growth, birth rate and death rate, age distribution.

Chapter-14: Ecosystem

Ecosystems : Patterns, components; productivity and decomposition; energy flow; pyramids of number, biomass, energy; nutrient cycles (carbon and phosphorous); ecological succession; ecological services - carbon fixation, pollination, seed dispersal, oxygen release (in brief).

Chapter-15: Biodiversity and its Conservation

Concept of biodiversity; patterns of biodiversity; importance of biodiversity; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, national parks, sanctuaries and Ramsar sites.

Chapter-16: Environmental Issues

Air pollution and its control; water pollution and its control; agrochemicals and their effects; solid waste management; radioactive waste management; greenhouse effect and climate change; ozone layer depletion; deforestation; any one case study as success story addressing environmental issue(s).

PRACTICALS

Time : 3 Hours

Max. Marks : 30

Evaluation Solution	
One Major Experiment Part - A (Expt. No. 5, 6, 8, 9)	5 marks
One Minor Experiment Part - A (Expt. No. 2, 3, 4)	4 marks
Slide Preparation Part - A (Expt. No. 1, 7)	5 marks
Spotting	7 marks
Practical Record + Viva Voce	4 marks
Project Record + Viva voce	5 marks
Total	30 marks

A. List of Experiments

60 Periods

1. Study pollen germination on a slide.
2. Collect and study soil from at least two different sites and study them for texture, moisture content, pH and water holding capacity. Correlate with the kinds of plants found in them.
3. Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organism.
4. Study the presence of suspended particulate matter in air at two widely different sites.
5. Study the plant population density by quadrat method.
6. Study the plant population frequency by quadrat method.
7. Prepare a temporary mount of onion root tip to study mitosis.
8. Study the effect of different temperatures and three different pH on the activity of salivary amylase on starch.
9. Isolate DNA from available plant material such as spinach, green pea seeds, papaya, etc.

B. Study/observation of the following (Spotting)

1. Flowers adapted to pollination by different agencies (wind, insects, birds).
2. Pollen germination on stigma through a permanent slide.
3. Identification of stages of gamete development, *i.e.*, T.S. of testis and T.S. of ovary through permanent slides (from grasshopper / mice).
4. Meiosis in onion bud cell or grasshopper testis through permanent slides. 5. T.S. of blastula through permanent slides (Mammalian).
6. Mendelian inheritance using seeds of different colour / sizes of any plant.
7. Prepared pedigree charts of any one of the genetic traits such as rolling of tongue, blood groups, ear lobes, widow's peak and colour blindness.
8. Controlled pollination - emasculation, tagging and bagging.
9. Common disease causing organisms like Ascaris, Entamoeba, Plasmodium, Roundworm through permanent slides or specimens. Comment on symptoms of diseases that they cause.
10. Two plants and two animals (models / virtual images) found in xeric conditions. Comment upon their morphological adaptations.
11. Two plants and two animals (models / virtual images) found in aquatic conditions. Comment upon their morphological adaptations.

QUESTION PAPER DESIGN 2017-18

BIOLOGY (Code No. 044) Class - XII

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 (VBQ) (4 marks)	Long Answer (LA) (5 marks)	Total Marks	% weight-age
1.	Remembering : (Knowledge based Simple recall questions, to know specific facts, 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 from a variety of sources)	2	—	1	—	1	10	14%
5.	Evaluation: (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	1×4=4	3×5=15	70 (26)	100%

QUESTION WISE BREAK UP

Type of Questions	Mark (s) per Questions	Total No. of Questions	Total Marks
VSA	1	5	05
SA - I	2	5	10
SA-II	3	12	36
VBQ	4	1	04
LA	5	3	15
Total		26	70

1. Internal Choice: There is no overall choice in the paper. However, there is an internal choice in one question of 2 marks weightage, one question of 3 marks weightage and all three questions of 5 marks weightage.
2. The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.



WRITING NOTES

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**EXAMINATION
PAPER**

**C.B.S.E.
2017
Class–XII
Delhi & Outside Delhi Set**

Biology

Time : 3 Hours

Max. Marks : 70

General Instructions :

- (i) There are total of 26 questions in five sections in the question paper. All questions are compulsory.
- (ii) Section A contains questions number 1 to 5, very short answer type questions of 1 mark each.
- (iii) Section B contains questions number 6 to 10, short answer type-I questions of 2 marks each.
- (iv) Section C contains questions number 11 to 22, short answer type-II questions of 3 marks each.
- (v) Section D contains question number 23, value based question of 4 marks.
- (vi) Section E contains questions number 24 to 26, long answer type questions of 5 marks each.
- (vii) There is no overall choice in the question paper, however, an internal choice is provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks. An examinee is to attempt any one question out of the two given in the question paper with the same question number.

Delhi Set I

Code No. 57/1/1

SECTION - A

- 1. Our government has intentionally imposed strict conditions for M. T. P. in our country. Justify giving a reason. 1
- 2. State the fate of a pair of autosomes during gamete formation. 1
- 3. What role does an individual organism play as per Darwin's theory of natural selection ? 1
- 4. Suggest a method to ensure an anamnestic response in humans. 1
- 5. What is biopiracy ? 1

SECTION - B

- 6. A mature embryo-sac in a flowering plant may possess 7-cells, but 8-nuclei. Explain with the help of a diagram only. 2
- 7. Describe the structure of a nucleosome. 2

OR

Mention the evolutionary significance of the following organisms :

- (a) Shrews (b) Lobefins (c) *Homo habilis* (d) *Homo erectus*

- 8. In an agricultural field there is a prevalence of the following organisms and crop diseases which are affecting the crop yield badly : 2
(a) White rust (b) Leaf and stripe rust (c) Black rot (d) Jassids
Recommend the varieties of crops the farmers should grow to get rid of the existing problem and thus improve the crop yield.
- 9. How does the application of the fungal genus. *Glomus*, to the agricultural farm increase the farm output ? 2
- 10. Plenty of algal bloom is observed in a pond in your locality. 2
(a) Write what has caused this bloom and how does it affect the quality of water.
(b) Suggest a preventive measure.

SECTION - C

- 11. (a) List the three stages the annuals and biennial angiosperms have to pass through during their life cycle. 3
(b) List and describe any two vegetative propagules in flowering plants.

12. Draw a labelled diagrammatic sectional view of a human seminiferous tubule. 3
13. During a medical investigation, an infant was found to possess an extra chromosome 21. Describe the symptoms the child is likely to develop later in the life. 3
14. A number of passengers were severely burnt beyond recognition during a train accident. Name and describe a modern technique that can help hand over the dead to their relatives. 3
15. $p^2 + 2pq + q^2 = 1$. Explain this algebraic equation on the basis of Hardy Weinberg's principle. 3
16. (a) What precautions would you recommend to a patient requiring repeated blood transfusion ?
 (b) If the advise is not followed by the patient, there is an apprehension that the patient might contract a disease that would destroy the immune system of his/her body. Explain with the help of schematic diagram only how the immune system would get affected and destroyed. 3
17. (a) What is inbreeding depression ?
 (b) Explain the importance of "selecting" during inbreeding in cattle. 3
18. Describe how do 'flocs' and 'activated sludge' help in Sewage Treatment. 3
19. Explain the role (s) of the following in Biotechnology :
 (a) Restriction endonuclease
 (b) Gel-electrophoresis
 (d) Selectable markers in pBR322. 3
20. Write the steps you suggest to be undertaken to obtain a foreign-gene-product. 3
21. Why do lepidopterans die when they feed on Bt cotton plant ? Explain how does it happen. 3
22. 'In-situ' conservation can help endangered/threatened species. Justify the statement. 3

OR

Name and describe any three causes of biodiversity losses.

SECTION - D

23. Public all over India is very much concerned about the deteriorating air quality in large parts of North India. Alarmed by this situation the Resident's Welfare Association of your locality organized an awareness programme entitled "Busy not burn". They invited you, being a biology student to participate. 4
 (a) How would you justify your arguments that promote burying and discourage burning. (Give two reasons.)
 (b) With the help of flowcharts, one for each practice depict the chain of events that follow.

SECTION - E

24. Read the following statement and answer the questions that follow : (1+4=5)
 "A guava fruit has 200 viable seeds".
 (a) What are viable seeds ?
 (b) Write the total number of :
 (i) Pollen grains (ii) Gametes
 in producing 200 viable guava seeds.
 (c) Prepare a flowchart to depict the post-pollination events leading to viable-seeds production in a flowering plant.

OR

- (a) Arrange the following hormones in sequence of their secretion in a pregnant women.
 (b) Mention their source and the function they perform :
 hcG : LH : FSH : Relaxin
25. State and explain the "law of independent assortment" in a typical Mendelian dihybrid cross. 5
- OR
- (a) How do the observations made during moth collection in pre- and post- industrialized era in England support evolution by Natural Selection ?
 (b) Explain the phenomenon that is well represented by Darwin's finches other than natural selection.
26. (a) What is an age-pyramid ?
 (b) Name three representative kinds of age-pyramids for human population and list the characteristics for each one of them.

OR

Describe the role of healthy ecosystem services as a pre- requisite for a wide range of economic, environmental and aesthetic goods and services. 5

Delhi Set II**Code No. 57/1/2****SECTION - A**

1. What is "fitness of an individual" according to Darwin ? 1

SECTION - B

6. By taking two examples explain how has bio- fortification helped in improving food quality. 2
 8. How does the application of cyanobacteria help improve agriculture output ? 2
 9. In a flowering plant a microspore mother cell produce four male gametophytes while a megaspore mother cell form only one female gametophyte. Explain. 2

SECTION - C

13. Differentiate between an annual and a biennial plant. Provide one example of each. 3
 15. A criminal blew himself up in a local market when was chased by cops. His face was beyond recognition. Suggest and describe a modern technique that can help establish his identity. 3
 22. A group of youth were having a 'rave party' in an isolated area and was raided by police. Packets of 'smack' and syringes with needles were found littered around.
 (a) Why is taking 'smack' considered an abuse ?
 (b) Write the chemical name of 'smack' and the name of its source plant.
 (c) Syringes and needles used by the youth for taking the drug could prove to be very fatal. Why ? 3

SECTION - E

25. Read the statement and answer the questions that follow :
 A flower of Brinjal has 520 ovules in its ovary. However, it produces a fruits with only 480 viable seeds.
 (a) What could have prevented the rest of the 40 ovules from mating into viable seeds ? Explain giving a reasons.
 (b) Describe the development of a dicot embryo in a viable seed.
 (c) Why certain angiosperms seed are albuminous while others are exalbuminous ? Explain. 5

OR

- (a) Name the hormones secreted and write their functions :
 (i) by corpus luteum and placenta (any two)
 (ii) during follicular phase and parturition.
 (b) Name the stages in a human female where :
 (i) Corpus luteum and placenta co-exist.
 (ii) Corpus luteum temporarily ceases to exist.

Delhi Set III**Code No. 57/1/3****SECTION - A**

5. Rearrange the human activities mentioned below as per the order in which they developed after the modern *Homo sapiens* came into existence during ice-age.
 (i) Human settlement (ii) Prehistoric cave art (iii) Agriculture 1

SECTION - B

7. How do mycorrhizae help the plants to grow better ? 2
 8. Mention the ploidy of the different types of cells present in the female gametophyte of an angiosperm. 2
 10. "Growing *spirulina* on a large scale is beneficial both environmentally and nutritionally for humans." Justify. 2

SECTION - C

11. During a fire in an auditorium a large number of assembled guests got burnt beyond recognition. Suggest and describe a modern technique that can help hand over the dead to their relatives. 3

16. Parthenocarpy and apomixis have been observed in some plants. Give an example of each. State a similarity and a difference observed between the two processes. 3
20. Show with the help of a flow chart only, the life cycle of malarial parasite in humans. 3

SECTION - E

26. (a) A capsicum flower has 240 ovules in its ovary. But, it produces a fruit with only 180 viable seeds. Explain giving a reason that could be responsible for such a result.
- (b) Describe the development of an endosperm in a viable seed. Why does endosperm development precede embryo development ?
- (c) Give an example of an angiosperm seed that has a perisperm. Name the part the perisperm develops from. 5

OR

- (a) Where in the fallopian tube does fertilization occur in humans ? Describe the development of a fertilized ovum upto implantation.
- (b) How is polyspermy prevented in humans ? (4+1=5)

■ ■

Outside Delhi Set I

Code No. 57/1

SECTION - A

1. Name the type of cross that would help to find the genotype of a pea plant bearing violet flowers. 1
2. State two postulates of Oparin and Haldane with reference to origin of life. 1
3. A herd of cattle is showing reduced fertility and productivity. Provide one reason and one suggestion to overcome this problem. 1
4. What are *Cry* genes ? In which organism are they present ? 1
5. An electrostatic precipitator in a thermal power plant is not able to generate high voltage of several thousands. Write the ecological implication because of it. 1

SECTION - B

6. A pollen grain in angiosperm at the time of dehiscence from an anther could be 2-celled or 3-celled. Explain. How are the cells placed within the pollen grain when shed at a 2-celled stage ? 2
7. Differentiate between the genetic codes given below : 2
- (a) Unambiguous and Universal
- (b) Degenerate and Initiator
8. Mention one application for each of the following : 2
- (a) Passive immunization (b) Anti-histamine (c) Colostrum (d) Cytokinin-barrier
9. Name the microbes that help production of the following products commercially : 2
- (a) Statin (b) Citric acid (c) Penicillin (d) Butyric acid
10. List four benefits to human life by eliminating the use of CFCs. 2

OR

- Suggest two practices giving one example of each, that help protect rare or threatened species. 2

SECTION - C

11. (a) Can a plant flowering in Mumbai be pollinated by pollen grains of the same species growing in New Delhi ? Provide explanations to your answer.
- (b) Draw the diagram of a pistil where pollination has successfully occurred. Label the parts involved in reaching the male gametes to its desired destination. 3
12. Both Haemophilia and Thalassemia are blood related disorders in humans. Write their causes and the difference between the two. Name the category of genetic disorder they both come under. 3
13. (a) List the two methodologies which were involved in human genome project. Mention how they were used. 3
- (b) Expand 'YAC' and mention what was it used for. 3
14. Write the characteristics of *Ramapithecus*, *Dryopithecus* and Neanderthal man. 3

15. Name a human disease, its casual organism, symptoms (any three) and vector, spread by intake of water and food contaminated by human faecal matter. 3

OR

- (a) Why is there a fear amongst the guardians that their adolescent wards may get trapped in drug/alcohol abuse ?
 (b) Explain 'addiction' and 'dependence' in respect of drug/alcohol abuse in youth. 3
16. (a) Write the desirable characters a farmer looks for in his sugarcane crop.
 (b) How did plant breeding techniques help north Indian farmers to develop cane with desired characters ? 3
17. Secondary treatment of the sewage is also called Biological treatment. Justify this statement and explain the process. 3
18. (a) Explain the significance of 'palindromic nucleotide sequence' in the formation of recombinant DNA.
 (b) Write the use of restriction endonuclease in the above process. 3
19. Describe the roles of heat, primers and the bacterium *Thermus aquaticus* in the process of PCR. 3
20. Explain the various steps involved in the production of artificial insulin. 3
21. (a) "Organisms may be conformers or regulators." Explain this statement and give one example of each.
 (b) Why are there more conformers than regulators in the animal world ? 3
22. Describe the inter-relationship between productivity, gross primary productivity and net productivity. 3

SECTION - D

23. It is commonly observed that parents feel embarrassed to discuss freely with their adolescent children about sexuality and reproduction. The result of this parental inhibition is that the children go astray sometimes.
 (a) Explain the reasons that you feel are behind such embarrassment amongst some parents to freely discuss such issues with their growing children.
 (b) By taking one example of a local plant and animal, how would you help these parents to overcome such inhibitions about reproduction and sexuality ? 4

SECTION - E

24. (a) When a seed of an orange is squeezed, many embryos, instead of one are observed. Explain how it is possible.
 (b) Are these embryos genetically similar or different ? Comment. 3+2=5

OR

- (a) Explain the following phases in the menstrual cycle of a human female :
 (i) Menstrual phase
 (ii) Follicular phase
 (iii) Luteal phase
 (b) A proper understanding of menstrual cycle can help immensely in family planning. Do you agree with the statement ? Provide reasons for your answer. 4+1=5
25. (a) Compare, giving reasons, the J-shaped and S-shaped models of population growth of a species.
 (b) Explain "fitness of a species" as mentioned by Darwin. 3+2=5

OR

- (a) What is an ecological pyramid ? Compare the pyramids of energy, biomass and numbers.
 (b) Write any two limitations of ecological pyramids. 4+1=5
26. (a) Describe the structure and function of a t-RNA molecule. Why is it referred to as an adapter molecule ?
 (b) Explain the process of splicing of hn-RNA in a eukaryotic cell.

OR

Write the different components of a lac-operon in *E. coli*. Explain its expression while in an 'open' state.

Outside Delhi Set II

Code No. 57/2

SECTION - A

3. Name the specific type of gene that is incorporated in a cotton plant to protect the plant against cotton boll worm infestation. 1

SECTION - B

6. Name the type of immunity the colostrum provides to a newborn baby. Write giving an example where this type of immunity should be provided to a person. 2

8. Write the binomials of two fungi and mention the products/bioactive molecules they help to produce. 2
10. "Pollen grains in wheat are shed at 3-celled stage while in peas they are shed at 2-celled stage." Explain. Where are germ pores present in a pollen grain? 2

SECTION - C

13. Explain the process of pollination in *Vallisneria*. How is it different in water-lily, which is also an aquatic plant? 3
15. What is disturbance in Hardy-Weinberg genetic equilibrium indicative of? Explain how it is caused. 3
18. Different animals respond to changes in their surroundings in different ways. Taking one example each, explain "some animals undergo aestivation while some others hibernation". How do fungi respond to adverse climatic conditions? 3
25. (a) Explain Polygenic inheritance and Multiple allelism with the help of suitable examples.
(b) "Phenylketonuria is a good example that explains Pleiotropy." Justify.

OR

- (a) What is an operon?
(b) Explain how a polycistronic structural gene is regulated by a common promoter and a combination of regulatory genes in a *lac-operon*.

Outside Delhi Set III

Code No. 57/3

SECTION - A

2. Bt-toxins are released as inactive crystals in the bacterial body. What happens to it in the cotton boll worm body that it kills the boll worm? 1

SECTION - B

7. Give the binomials of two types of yeast and the commercial bioactive products they help to produce. 2
9. How many cells are present in the pollen grains at the time of their release from anther? Name the cells. 2
10. Name the group of cells the HIV enters after getting into the human body. What happens in these cells and what are these cells subsequently referred to as? Name the next group of cells the HIV attacks from here. 2

SECTION - C

16. (a) Trace the development of an endosperm after fertilisation with reference to coconut. Mention the importance of endosperm development.
(b) Write the importance of 'pollen bank'. 3
22. How do kangaroo rats and desert plants adapt themselves to survive in their extreme habitat? Explain. 3

SECTION - E

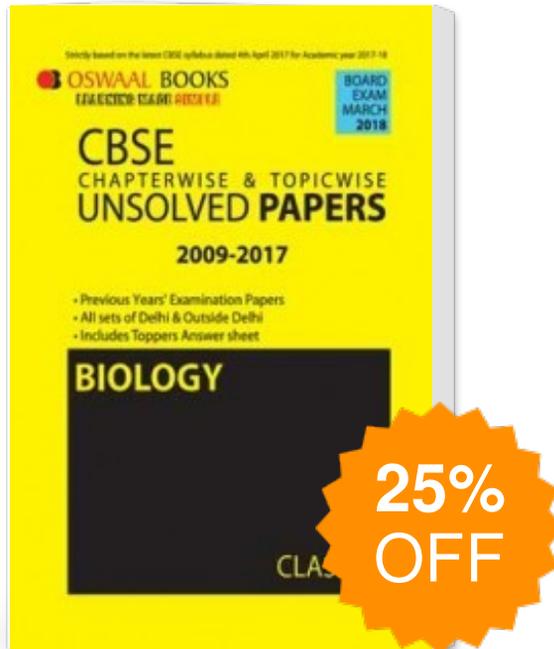
24. (a) A pea plant bearing axial flowers is crossed with a pea plant bearing terminal flowers. The cross is carried out to find the genotype of the pea plant bearing axial flowers. Work out the cross to show the conclusions you arrive at.
(b) State the Mendel's law of inheritance that is universally acceptable. 4+1=5

OR

- (a) Absence of lactose in the culture medium affects the expression of a *lac-operon* in *E. coli*. Why and how? Explain.
(b) Write any two ways in which the gene expression is regulated in eukaryotes. 4+1=5

■ ■

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