

JB ACADEMY, AYODHYA
HALF YEARLY EXAMINATION (2025-26)
CLASS – XII (BIOLOGY – Code No. 044)

Time: 3 hours

Max.Marks: 70

General Instructions:

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

SECTION - A

Q1 Which of the following statements are true related to Seed X and Y?



- (i) Seed X is dicot and endospermic or albuminous.
- (ii) Seed X is dicot and non-endospermic or nonalbuminous.
- (iii) Seed Y is monocot and endospermic or albuminous.
- (iv) Seed Y is monocot and non-endospermic or nonalbuminous.

Choose the correct option with respect to the nature of the seed

- (a) (i), (iii) (b) (ii), (iii) (c) (i), (iv) (d) (ii), (iv)

Q2. Which of the following seeds have remained alive for the longest period?

- (a) Phoenix dactylifera (b) Striga asiatica (c) Mangifera indica (d) Yucca gigantea

Q3. The correct sequence of hormone secretion from beginning of menstruation is

- (a) FSH, Progesterone, Estrogen. (b) Estrogen, FSH, Progesterone.
(c) FSH, Estrogen, Progesterone (d) Estrogen, Progesterone, FSH.

Q4. In a dihybrid Mendelian cross, garden pea plants heterozygous for yellow flowers and round seeds are crossed with homozygous white flowers and wrinkled seeds. The genotypic and phenotypic ratio of F1 progeny would be:

- (a) 9 : 3 : 3 : 1 (b) 1 : 2 : 2 : 1 (c) 1 : 1 : 1 : 1 (d) 3 : 1

Q5. In chick pea assume that there is no linkage and allele of large seed (L) is dominant over small seed (l) and green colour seed (G) is dominant over yellow colour seed (g). Two chick pea parent plants when crossed resulted in progeny having seeds with phenotypes small seeds and green colour, and large seeds with yellow colour besides other phenotypic progenies. Select the genotype of these two parents plants.

- (a) LLGG × llgg (b) llgg × LLgg (c) llGG × llGg (d) llGg × Llgg

Q6 A typical Mendalian dihybrid cross between a homozygous round, yellow-seeded plant and a homozygous wrinkled, green-seeded plant produced round, green-seeded plants and wrinkled yellow-seeded plants also in the F₂ generation. The ratio between individuals of phenotypes with parental combinations and recombinations of traits will be

- (a) 9 : 7 (b) 10 : 6 (c) 12 : 4 (d) 15 : 1

Q7 The recombinant frequency between the four linked genes is as follows:

- (i) between X and Y is 40% (ii) between Y and Z is 30%
(iii) between Z and W is 10% (iv) between W and X is 20%

Select the option that shows the correct order of the position of W, X, Y and Z genes on the chromosome.

- (a) Y - X - Z - W (b) X - Z - W - Y (c) X - Y - Z - W (d) Z - X - Y - W

Q8 In human beings, where genotype AAB_BCC represents dark skin colour, aabbcc represents light skin colour and AaBbCc represents intermediate skin colour, the pattern of genetic inheritance can be termed as:

- (a) Pleiotropy and codominance (b) Pleiotropy and incomplete dominance
(c) Polygenic and qualitative inheritance (d) Polygenic and quantitative inheritance

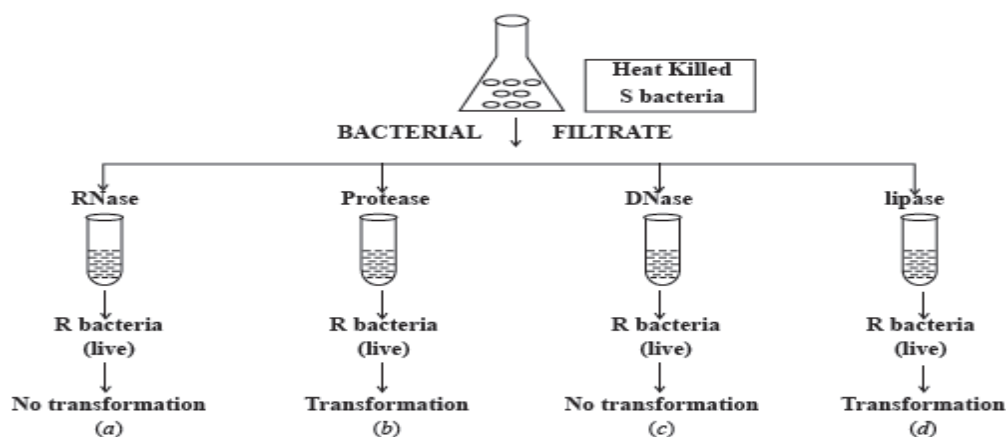
Q9 Rajesh and Mahesh have defective haemoglobin due to genetic disorders. Rajesh has too few globin molecules while Mahesh has incorrectly functioning globin molecules. Identify the disorder they are suffering from.

	Rajesh	Mahesh
(a)	Sickle cell anaemia – an autosome linked recessive trait	Thalassemia – an autosome linked dominant trait
(b)	Thalassemia – an autosome linked recessive blood disorder	Sickle cell anaemia – an autosome linked recessive trait
(c)	Sickle cell anaemia – an autosome linked recessive trait	Thalassemia – an autosome linked recessive blood disorder
(d)	Thalassemia – an autosome linked recessive blood disorder	Sickle cell anaemia – an autosome linked dominant trait

Q10 A stretch of an euchromatin has 200 nucleosomes. How many bp will there be in the stretch of the typical euchromatin?

- (a) 20,000 bp (b) 10,000 bp (c) 40,000 bp (d) 30,000 bp

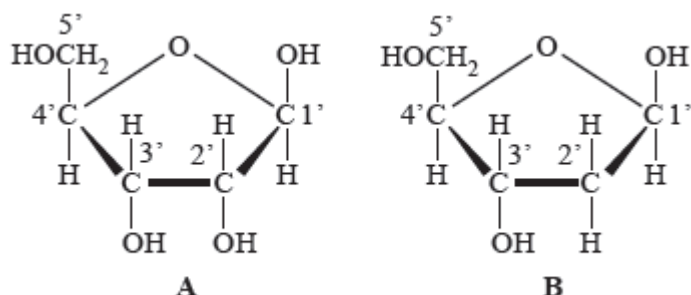
Q11 Given below are the illustration of the different steps of experiments conducted by Macleod, Mccarty and Avery to find the chemical nature of the ‘transforming principle’ as DNA. Select the option that incorrectly depicts the step of the experiment.



Q12. Given below is a list of steps Meselson and Stahl carried out in their experiment to prove that DNA replication is semi-conservative. Select the option that gives the correct sequence of steps followed by them.

- (i) Bacteria transferred to a N14 medium and sampled every 20 minutes.
 - (ii) All bacteria contain hybrid DNA (N14 DNA and N15 DNA).
 - (iii) Bacteria grown in N15 medium for many generations.
 - (iv) All bacteria contain N15 DNA.
 - (v) Bacteria contain either all N14 DNA or all hybrid DNA.
- (a) (ii) → (iv) → (iii) → (i) → (v) (b) (i) → (ii) → (v) → (iv) → (iii)
- (c) (iii) → (iv) → (i) → (ii) → (v) (d) (iv) → (iii) → (ii) → (v) → (i)

Q13. Observe structures A and B given below. Which of the following statements are correct?



- (a) A is having 2'-OH group which makes it less reactive and structurally stable, whereas B is having 2'-H group which makes it more reactive and unstable.
- (b) A is having 2'-OH group which makes it more reactive and structurally unstable, whereas B is having 2'-H group which makes it less reactive and structurally stable.
- (c) A and B both have -OH groups which make it more reactive and structurally stable.
- (d) A and B both are having -OH groups which make it less reactive and structurally stable

Question No. 14 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- A. Both A and R are true and R is the correct explanation of A.
- B. Both A and R are true and R is not the correct explanation of A.
- C. A is true but R is false.
- D. A is False but R is true.

Q14. Assertion: Morgan in his experiments with *Drosophila* found that the genes for white eyes and miniature wings showed 37.2 per cent recombination, whereas the genes for white eyes and yellow body showed 1.3 per cent recombination.

Reason: The frequency of recombination is directly proportional to the physical distance between the two genes present on the same chromosome.

Q15. Assertion: In prokaryotic/bacterial cells, transcription and translation can be coupled.

Reason: In eukaryotic cells, transcription occurs in the nucleus and translation occurs in the cytoplasm.

Q16. Assertion: Reproductive and Child Health Care (RCH) program was initiated in India in 1951 to attain total reproductive health as a social goal.

Reason: Audio-visual and print media awareness was created among the people about reproduction related aspects under the program.

SECTION-B

Q17. (a) How many mitotic divisions occur in the formation of an embryo sac in an angiosperm plant? State the characteristic feature of these mitotic divisions.

(b) When does cell wall formation start, in the organization of the embryo sac?

Q18. (a) Where do the signals for parturition originate from, in humans?

(b) Why is it important to feed the new born babies on colostrum?

Q19. A woman has certain queries as listed below, before starting with contraceptive pills. Answer Them.

(a) What do contraceptive pills contain? How do they act as contraceptives?

(b) What schedule should be followed for taking these pills?

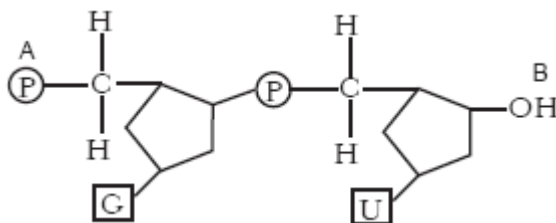
Q20. (a) Write the genotypes of :

(i) an individual who is a carrier of sickle-cell anaemia gene, but apparently unaffected, and

(ii) an individual affected with the disease.

(b) Why do normal red blood cells become elongated sickle-shaped structure in a person suffering from sickle-cell anaemia?

Q21. Answer the questions based on the dinucleotide shown below:



(i) Name the type of sugar, the guanine base is attached to.

(ii) Name the linkage connecting the two nucleotides.

(iii) Identify the 3' end of the dinucleotide. Give a reason for your answer.

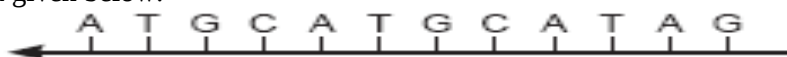
(iv) Name the linkage connecting the guanine with sugar.

SECTION – C

Q22. With respect to Messelson and Stahl's Experiment, answer the following questions:

- (a) Write the name of the chemical substance used as a source of nitrogen in the experiment by them.
- (c) Identify the method used to distinguish between heavy and light isotopes of nitrogen.
- (c) With the help of diagrams, compare the results for the DNA isolated after 20 minutes of experiments with the DNA which was isolated after 40 minutes.

Q23. (a) Construct a complete transcription unit with promoter and terminator on the basis of the hypothetical coding strand given below:

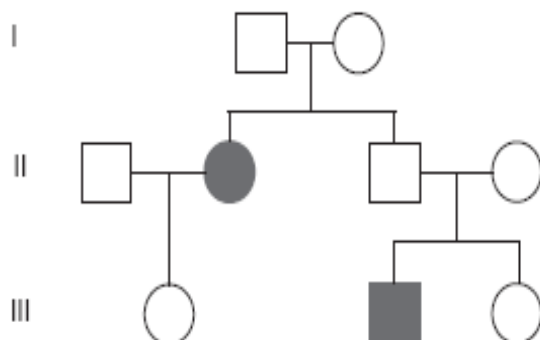


- (b) Write the RNA strand transcribed from the above transcription unit along with its polarity.

Q24 (a) Name the scientist who called t-RNA an adapter molecule.

- (b) Draw a clover leaf structure of t-RNA showing the following:
 - (i) Tyrosine attached to its amino acid site.
 - (ii) Anticodon for this amino acid in its correct site. (codon for tyrosine is UCA).
- (c) How does the functional structure of t-RNA look like?

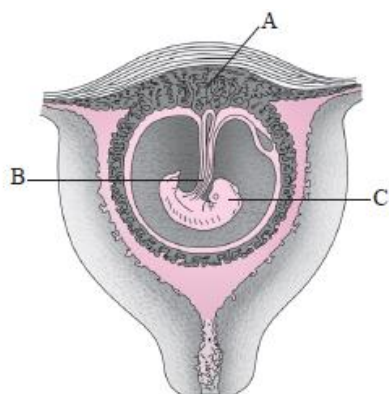
Q25. Study the pedigree chart given below showing the inheritance pattern of a human trait and answer the questions that follow:



- (i) Give the genotype of the parents shown in generation I and of the son and daughter shown in generation II.
- (ii) Give the genotype of the daughter shown in generation III.
- (iii) Is the trait sex-linked or autosomal? Justify your answer.

OR

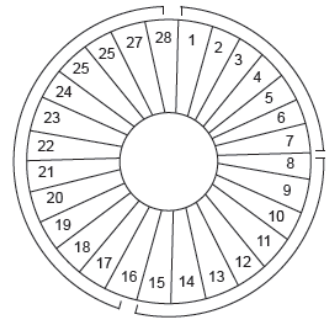
The following figure shows a foetus within the uterus of a human female. On the basis of the given figure, answer the questions that follow:



- (a) In the above figure, name the part (A, B or C) that acts as a temporary endocrine gland. Substantiate your answer with two examples. Why it is called 'functional junction' also?
- (b) Mention the role of B in the embryo development.

Q26. Observe the diagram given below showing the menstrual cycle of a normal human female and answer the questions that follow:

- (a) What are the suitable technical terms used for the following?
- (i) Days 1 – 5 (ii) Days 6 – 12 (iii) Days 16 – 28 (iv) Days 13 – 15
- (b) Explain the role of ovarian and pituitary hormones during the following time periods:
- (i) Days 6 – 12 (ii) Days 13 – 15 (iii) Days 16 – 28

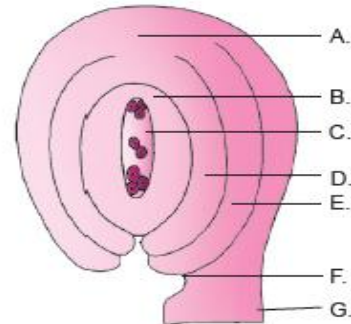


Q27. Suggest a suitable contraceptive device for the following cases with justification.

- (i) Mohini does not want to take the risk of conception and sexually transmitted infections (STIs).
- (ii) Lalita has two children and does not want any more children.
- (iii) Geeta wants a contraceptive that she can take till she wants to avoid conception and can resume back to her fertile life without the intervention of the doctor. Also, it should have a lower failure rate

Q28 (a) Give the name of the ovule type.

- (b) Identify and name the part that
- (i) attaches the ovule to the placenta.
- (ii) forms the testa of seed.
- (iii) represents the basal part of the ovule.
- (iv) is the junction between the body of the ovule and its stalk.
- (c) What is micropyle in an ovule? Mention its significance.

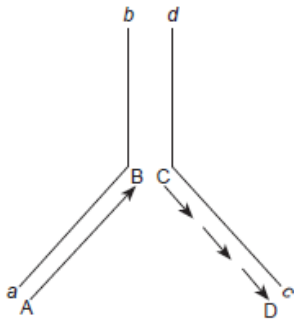


SECTION – D

Q29. The chromosome number is fixed for all normal organisms leading to species 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, leading to the production of abnormal gametes with altered chromosome number. On fertilisation such gametes develop into abnormal individuals.

- (a) State what is aneuploidy and how it is caused?
- (b) If during spermatogenesis, the chromatids of sex chromosomes fail to segregate during meiosis, write only the different types of gametes with altered chromosome number that could possibly be produced.
- (c) A normal human sperm ($22 + Y$) fertilises an ovum with karyotype ' $22 + XX$ '. Name the disorder the offspring thus produced would suffer from and write any two symptoms of the disorder.
- (d) Name a best known and most common autosomal aneuploid abnormality in human and write any two symptoms.

Q30. A DNA replication fork is shown below. Observe the sketch and answer the questions that follow:



- (a) When and where does replication of DNA occur in eukaryotic cells and prokaryotic cells?
- (b) Identify the polarity of the strands a-b, c-d, A-B and C-D
- (c) Why does DNA replication occur in such small forks? Name the major enzyme that catalyses this process.
- (d) Why is DNA synthesis continuous and discontinuous on the two strands? What name is given to?
 - (i) the continuously synthesized strand (A – B)
 - (ii) the small segments of the strand (C – D)

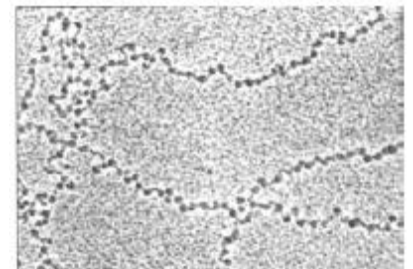
SECTION – E

Q31. (a) What is Lac operon and who proposed it?

(b) With the help of neat labelled diagram of lac operon, explain gene expression regulation in *E. coli*

- (i) When glucose is present and lactose is absent
- (ii) When glucose is absent and lactose is present

Q32. Shown above is the electron micrograph (EM) picture of ‘beads-on string’.



- (a) Explain the detailed structure of a bead with the help of a labelled diagram.
- (b) Describe the packaging of ‘beads-on-string’ in a eukaryotic cell.
- (c) Differentiate between Euchromatin and Heterochromatin
- (d) Histone protein is positively charged and DNA is negatively charged. Why ?

OR

Given below is a stretch of DNA showing the coding strand of a structural gene of a transcription unit.

5'--ATG ACC GTA TTT TCT GTA GTG CCC GTA CTT CAG GCA TAA—3'

- a) Write the corresponding template strand and the mRNA strand that will be transcribed, along with its polarity.
- b) If GUA of the transcribed mRNA is an intron, depict the sequence involved in the formation of mature m-RNA
 - i) In a bacterium
 - ii) In humans
- c) Upon translation, how many amino acids will the resulting polypeptide have? Justify.

Q33. (a) Briefly explain the events of fertilization and implantation in an adult human female with the help of diagram.

(b) Comment on the role of placenta as an endocrine gland.

OR

(a) Draw a diagram of an enlarged view of T.S. of one microsporangium of an angiosperm and label the following parts:

- (i) Tapetum
- (ii) Middle layers
- (iii) Endothecium
- (iv) Sporogenous tissue

(b) Mention the characteristic features and function of tapetum.

(c) Explain the following giving reasons:

(i) Pollen grains are well-preserved as fossils.

(ii) Pollen tablets are in use by people these days.

(d) A bilobed dithecal anther has 65 microspore mother cell per microsporangium. Calculate the number of male gametophytes produced by a flower with 8 stamens.