SmartKalike

CBSE Class 12 · Biology

Molecular Basis of Inheritance

10 most probable questions for Boards 2027

Q1. 0.5 marks · Very short answer

Name the two scientists who demonstrated semiconservative DNA replication in E. coli.

Answer

Matthew Meselson and Franklin Stahl demonstrated semiconservative DNA replication in E. coli in 1958.

Q2. 1 mark · Multiple choice

Which set lists the three components of a nucleotide?
(A) Nitrogenous base, pentose sugar and phosphate group
(B) Nitrogenous base, amino acid and phosphate group
(C) Pentose sugar, amino acid and fatty acid
(D) Nitrogenous base, glycerol and pentose sugar

Answer

(A) Nitrogenous base, pentose sugar and phosphate group — these are the three components of a nucleotide.

Q3. 2 marks · Short answer

State how the sugar and the presence of thymine or uracil differ between DNA and RNA. Name the purine bases and the pyrimidine bases.

Answer

DNA contains deoxyribose, while RNA contains ribose. Thymine is present in DNA, whereas uracil is present in RNA in place of thymine. Purines are Adenine and Guanine; pyrimidines are Cytosine, Uracil and Thymine.

Q4. 3 marks · Medium answer

Describe how DNA is organised in the nucleoid of E. coli. Then explain the role of histones and the histone octamer in eukaryotic DNA packaging, including how a nucleosome forms.

Answer

1. In E. coli, DNA is not scattered throughout the cell despite the absence of a defined nucleus. Negatively charged DNA is held with positively charged proteins in a region termed the nucleoid, where it is organised in large loops held by proteins.
2. Eukaryotic histones are positively charged, basic proteins rich in lysine and arginine residues. Eight histone molecules form a histone octamer.
3. Negatively charged DNA wraps around the positively charged histone octamer to form a nucleosome, which typically contains 200 bp of DNA helix.

Q5. 4 marks · Multiple choice

Which option correctly describes the Hershey–Chase experiment and its inference? (This question is worth 4 marks.)
(A) Blending removed viral coats and centrifugation separated phages from bacteria; bacteria became radioactive when infected with phages labelled in DNA, but not when infected with phages labelled in protein.
(B) Blending separated DNA from protein; bacteria became radioactive only when infected with protein-labelled phages.
(C) Centrifugation removed the bacterial cells; both DNA-labelled and protein-labelled phages entered the bacteria.
(D) Blending caused the phages to inject their coats; the experiment showed that protein, not DNA, entered bacteria.

Answer

(A) Blending removed viral coats and centrifugation separated phages from bacteria; bacteria became radioactive when infected with phages labelled in DNA, but not when infected with phages labelled in protein. — DNA entered the bacteria, whereas protein did not.

Q6. 5 marks · Long answer

Explain how a nitrogenous base, a pentose sugar and a phosphate group are linked to form a nucleotide. Then describe how nucleotides join to form a polynucleotide chain, naming the linkages involved.

Full answer on SmartKalike: https://smartkalike.com/cbse/class-12/biology/molecular-basis-of-inheritance

Q7. 0.5 marks · Very short answer

After it was demonstrated in E. coli, in what broader group of organisms was semiconservative DNA replication subsequently shown?

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Q8. 1 mark · Multiple choice

Which description best fits the arrangement of the two polynucleotide chains in DNA?
(A) They have sugar-phosphate backbones with bases projecting inward.
(B) They have bases on the outside and phosphate groups paired inward.
(C) They are parallel, with both 5′ ends at the same end.
(D) They are identical in sequence and run in the same direction.

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Q9. 2 marks · Short answer

Describe the antiparallel orientation of the two DNA strands and state the base-pairing rules, including the number of hydrogen bonds in each pair.

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Q10. 3 marks · Medium answer

Explain why DNA synthesis is continuous on one template strand and discontinuous on the other at a replication fork. State the direction in which DNA polymerase synthesises DNA and the role of DNA ligase. (3 marks)

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