

1. Answer the following questions.

[1 mark]

1. A human cell containing 22 autosomes and a Y chromosome is

- a) A sperm
- b) An egg
- c) A somatic cell of a female
- d) A somatic cell of a male

2. If the DNA content of a diploid cell in the G₁ phase of the cell cycle is X, then the DNA content of the same cell at metaphase of meiosis I would be

- a) x
- b) 2x
- c) 0.5 x
- d) 0.25x

3. How many different combinations of maternal and paternal chromosomes can be packaged in gametes made by an organism with a diploid number of 8 ($2n=8$)?

- a) 2
- b) 4
- c) 8
- d) 16

4. Homologous chromosomes move toward opposite poles of a dividing cell during

- a) Mitosis
- b) Meiosis I
- c) Meiosis II
- d) Fertilization

5. Meiosis II is similar to mitosis in that

- a) Sister chromatids separate during anaphase
- b) The daughter cells are diploid
- c) Homologous chromosomes synapse
- d) DNA replicates before the division

6. Mitochondrial DNA is advantageous for evolutionary studies because:

- a) It is inherited only through the female parent and thus evolves in a way that allows tracing of relationship to be easily constructed
- b) It is inserted into the X chromosomes
- c) It evolves more slowly than the genes in the nucleus
- d) It first appeared in humans and is not found in other animals

7. Which of the following are similar between transcription in prokaryotes and eukaryotes?

- a) RNA polymerase produces mRNAs which grow in the 5'-3' direction
- b) RNA polymerase bind to ribosomes to allow transcription
- c) A polytail is added to the 3' end of messenger RNAs
- d) Introns are present in genes which are spliced out after transcription

8. Translation involves

- a) Mapping genes in bacteria using a viral carrier
- b) Reading a DNA strand and making an mRNA copy
- c) Taking up DNA into a cell and changing its genetic makeup
- d) Reading an mRNA to yield an amino acid sequence in a protein

9. The normal function of a promoter is to:

- a) Bind the small subunit of the ribosome
- b) Serve as an origin of DNA replication
- c) Serve as an acceptor for transfer RNA
- d) Serve as a binding site for RNA polymerase

10. The process of DNA replication involves:

- a) Multiple origins of replication per chromosome in eukaryotes
- b) Binding of ribosomes to origins of replication
- c) Continuous synthesis on both strands of the double helix
- d) Conservative replication, with one original double helix and one totally new double helix as products

Answer

1. a) A sperm
2. b) 2x
3. d) 16
4. b) Meiosis I
5. a) Sister chromatids separate during anaphase
6. a) It is inherited only through the female parent and thus evolves in a way that allows tress of relationship to be easily constructed
7. a) RNA polymerase produces mRNAs which grow in the 5'-3' direction
8. d) Reading an mRNA to yield an amino acid sequence in a protein
9. d) Serve as a binding site for RNA polymerase
10. a) Multiple origins of replication per chromosome in eukaryotes

2. Answer the following questions within 2-3 sentences.

[1.5 mark]

1. What are the components of nucleotides ?
2. What do you mean by replication fork ?
3. What are okazaki fragments ?
4. What is a replison ?
5. What is the function of DNA Polymerase II ?
6. Define genetic code. What do you understand by degeneracy of genetic code ?
7. Which genetic material is better , DNA vs RNA ? Why.
8. Mention some translational inhibitor .
9. Mention some function of tRNA?
10. Mention some function of mRNA?
11. Mention some function of rRNA?
12. What is capping and tailing ?
13. What is the role of chromatin in gene expression ?

14. Differentiate between replication in Prokaryotes and eukaryotes?
15. What is D-loop model of DNA replication ?
16. How is prokaryotic translation is different from eukaryotic translation ?
17. What are extra chromosomal replicons ?
18. Give the structure of tRNA.
19. What is translational proof reading ?
20. What do you mean by Central Dogma ?

3. Answer the following questions within 75-100 words.

[2 marks]

1. Name the components of DNA Pol II holoenzyme .
2. Write a short note on DNA Polymerase I.
3. State about DNA Polymerase III.
4. Describe DNA Polymerase IV and DNA Polymerase v.
5. What is gene silencing ?
6. Mention attributes of genetic code.
7. Mention some post-transcriptional modifications of proteins.
8. What is RNA and its function ?
9. Draw structure of mRNA and rRNA .
10. Draw structure of tRNA.
11. What do you mean by splicing ?

4. Answer the following questions within 500 words.

[6marks]

1. Explain DNA replication in prokaryotes.
2. State D-loop model of DNA replication.
3. State about DNA replication in ss- DNA.
4. What is rolling circle replication ?
5. Explain DNA replication in eukaryotes.
6. Give a detailed account on DNA damage and repair.
7. What do you understand by homologous and site specific recombination.
8. Write short note on transcription factors and machinery.
9. What are transcription activators and repressors.? Add a note on formation of initiation complex .
10. Write short note on RNA Polymerase.
11. State about capping ,elongation and termination.
12. What is RNA processing ? Also state about RNA editing , splicing and polyadenylation.
13. Write the structure and function of different types of RNA.
14. Give an account on RNA transport.
15. What is genetic code and its attributes .?
16. What is the molecular mechanism of translation in prokaryote sand eukaryotes ?
17. What do you mean by translational proof reading . Add a note on translational inhibition.
18. Explain about post translational modification of proteins.
19. How is the expression of phage , virus , prokaryotic & eukaryotic genes regulated ?
20. Give the role of chromatin in gene expression and gene silencing.