1. The starting material for purine nucleotide biosynthesis is:

(a) Glucose

(b) Ribose-5-phosphate

(c) Amino acids

(d) Uracil

2. De novo synthesis and salvage pathway are two major pathways for:

(a) Purine nucleotide synthesis

(b) Pyrimidine nucleotide synthesis

(c) Both (a) and (b)

(d) Neither (a) nor (b)

3. The enzyme responsible for the formation of orotic acid in pyrimidine synthesis is:

(a) Dihydrofolate reductase

(b) Carbamoyl phosphate synthetase II

(c) Aspartate transcarbamoylase

(d) Orotate phosphoribosyltransferase

4. Ribose sugar in RNA nucleotides is different from deoxyribose sugar in DNA nucleotides by the presence of an extra:

(a) Phosphate group

(b) Hydroxyl group

(c) Amino group

(d) Methyl group

5. Which of the following is NOT a precursor for purine ring formation?

(a) Glutamine

(b) Aspartate

(c) Glycine

(d) Thymine

6. The end product of purine nucleotide catabolism in humans is:

(a) Adenine

(b) Guanine

(c) Uric acid

(d) Xanthine

7. Hyperuricemia refers to an abnormally high level of:

(a) Uric acid

(b) Uric acid salts

(c) Urea

(d) Ammonia

8. Gout is a form of inflammatory arthritis caused by the deposition of crystals formed from:

(a) Uric acid

(b) Uric acid salts

(c) Calcium oxalate

(d) Cholesterol

9. Allopurinol is a medication used to treat gout by inhibiting the enzyme:

(a) Xanthine oxidase

(b) Adenosine deaminase

(c) Uricase

(d) Dihydrofolate reductase

10. Lesch-Nyhan syndrome is a genetic disorder characterized by:

(a) Hyperuricemia and self-mutilating behavior

(b) Pyrimidine deficiency and anemia

(c) De novo purine synthesis defect

(d) Uric acid kidney stones

11. DNA replication is a:

(a) Semi-conservative process

(b) Conservative process

(c) Dispersive process

(d) Random process

12. During transcription, the enzyme RNA polymerase catalyzes the synthesis of:

(a) DNA from RNA

(b) RNA from DNA

(c) Protein from RNA

(d) DNA from protein

13. The genetic code is a triplet code, meaning each codon consists of:

(a) Two nucleotides

(b) Three nucleotides

(c) Four nucleotides

(d) Five nucleotides

14. Transfer RNA (tRNA) molecules are responsible for:

(a) Carrying amino acids to the ribosome

(b) Initiating protein synthesis

(c) Elongating the growing polypeptide chain

(d) All of the above

15. During translation, ribosomes move along the mRNA in a:

(a) 5' to 3' direction

(b) 3' to 5' direction

16. The genetic material in eukaryotic cells is organized into chromosomes within the:

(a) Nucleus

(b) Cytoplasm

(c) Mitochondria

(d) Endoplasmic reticulum

17. The non-coding regions of DNA are called:

(a) Exons

(b) Introns

(c) Genes

(d) Codons

18. Euchromatin is a loosely packed region of DNA that is:

(a) Transcriptionally active

(b) Transcriptionally inactive

(c) Highly condensed

(d) Found only in prokaryotes

19. Histones are proteins that package DNA into a structure called:

(a) Nucleosome

(b) Chromosome

(c) Centromere

(d) Telomere

20. Telomeres are repetitive sequences of DNA at the ends of chromosomes that:

(a) Help prevent chromosome fusion and degradation

(b) Contain genes essential for cell survival

(c) Determine the sex of the organism

(d) Are responsible for eye color inheritance

21. DNA and RNA are both nucleic acids, but a key difference lies in their sugar component. Which sugar is present in RNA but not DNA?

(a) Deoxyribose

(b) Ribose

(c) Glucose

(d) Fructose

22. The nitrogenous bases found in DNA include adenine (A), guanine (G), cytosine (C), and:

(a) Uracil (U)

(b) Thymine (T)

(c) Xanthine (X)

(d) Hypoxanthine (H)

23. In DNA, adenine always pairs with:

(a) Uracil (U)

(b) Thymine (T)

(c) Cytosine (C)

(d) Guanine (G)

24. Messenger RNA (mRNA) is responsible for:

(a) Storing genetic information

(b) Transferring genetic information to ribosomes

(c) Carrying amino acids during protein synthesis

(d) Breaking down glucose for energy

25. Transfer RNA (tRNA) molecules function by:

(a) Initiating protein synthesis

(b) Elongating the growing polypeptide chain

(c) Matching specific codons with their corresponding amino acids

(d) All of the above

26. DNA replication is a process that ensures:

(a) Random segregation of chromosomes during cell division

(b) Formation of identical copies of DNA before cell division

(c) Repair of damaged DNA segments

(d) Creation of genetic diversity

27. The semi-conservative model of DNA replication states that each new double helix contains:

(a) One parental strand and two newly synthesized strands

(b) Two parental strands and one newly synthesized strand

(c) Completely new strands of DNA

(d) A random mix of parental and new DNA

28. During DNA replication, the enzyme DNA helicase functions by:

(a) Priming DNA synthesis with a short RNA sequence

(b) Unwinding the double helix to create a replication fork

(c) Proofreading newly synthesized DNA for errors

(d) Joining the sugar-phosphate backbones of nucleotides

29. DNA polymerase is responsible for:

(a) Elongating the growing DNA strand by adding nucleotides

(b) Separating the two parental DNA strands

(c) Stabilizing the newly synthesized DNA strand

(d) Recognizing and repairing mismatched nucleotides

30. Okazaki fragments are short, newly synthesized DNA segments formed during replication on the:

(a) Leading strand

(b) Lagging strand

(c) Both strands equally

(d) Neither strand

31. Transcription refers to the process of synthesizing:

(a) DNA from RNA

(b) RNA from DNA

(c) Protein from RNA

(d) DNA from protein

32. In eukaryotes, RNA polymerase II is responsible for transcribing:

(a) tRNA molecules

(b) rRNA molecules

(c) mRNA molecules

(d) All of the above

33. The primary transcript produced during transcription may undergo processing, such as capping and tailing, to become a mature:

(a) tRNA molecule

(b) rRNA molecule

(c) mRNA molecule

(d) All of the above

34. The genetic code is a set of rules that governs the translation of:

(a) Amino acid sequence into protein structure

(b) DNA sequence into RNA sequence

(c) RNA sequence into protein sequence

(d) Protein structure into DNA sequence

35. Each codon in mRNA consists of:

(a) Two nucleotides

(b) Three nucleotides

(c) Four nucleotides

(d) Five nucleotides

36. Ribosomes are cellular structures responsible for:

(a) DNA replication

(b) Transcription

(c) Protein synthesis (translation)

(d) Cellular respiration

37. During translation, transfer RNA (tRNA) molecules:

(a) Carry amino acids to the ribosome

(b) Elongate the growing polypeptide chain

(c) Initiate protein synthesis

(d) All of the above

38. Elongation factors in translation are responsible for:

(a) Bringing together the correct tRNA and mRNA

(b) Forming peptide bonds between amino acids

(c) Facilitating the movement of the ribosome along mRNA

(d) All of the above

39. Antibiotics like tetracycline inhibit protein synthesis by targeting the:

(a) A site on the ribosome where aminoacyl-tRNA binds

(b) Elongation factors involved in translation

(c) Enzyme responsible for mRNA activation

(d) RNA polymerase during transcription

40. Actinomycin D is an antibiotic that disrupts protein synthesis by inhibiting:

(a) Ribosome function

(b) Elongation factors

(c) RNA polymerase during transcription

(d) Aminoacyl-tRNA synthetase enzymes