BUDDHA SERIES

(Unit Wise Solved Question & Answers)

Course – B.Sc. Zoology 2nd year 3rd semester

College – Buddha Degree College
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Department: Science
Subject: Molecular biology and bioinstrumentation & biotechniques

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Unit – 1

1. What is the genetic code based on?

A) DNA sequence

B) RNA sequence

C) Protein structure

D) Cell membrane

Answer: A) DNA sequence

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2. Which of the following is a start codon?

A) AUG

B) UAA

C) GUU

D) CCA

Answer: A) AUG

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3. What does the genetic code specify?

A) Amino acid sequence

B) Protein structure

C) Gene expression

D) Cell signaling

Answer: A) Amino acid sequence

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4. How many nucleotides are required to specify one amino acid?

A) 2

B) 3

C) 4

D) 6

Answer: B) 3

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5. What is the universal code?

A) The genetic code is same for all organisms

B) The genetic code varies among organisms

C) The genetic code is specific to eukaryotes

D) The genetic code is specific to prokaryotes

Answer: A) The genetic code is same for all organisms

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6. Which amino acid is encoded by the codon UUU?

A) Phenylalanine

B) Leucine

C) Isoleucine

D) Valine

Answer: A) Phenylalanine

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7. What is the function of the stop codon?

A) Initiates translation

B) Terminates translation

C) Specifies amino acid

D) Regulates gene expression

Answer: B) Terminates translation

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8. How many stop codons are there?

A) 1

B) 2

C) 3

D) 4

Answer: C) 3

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9. Which of the following is not a codon?

A) AUG

B) UUU

C) AAA

D) ABC

Answer: D) ABC

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10. What is degeneracy in the genetic code?

A) Multiple codons specify same amino acid

B) Single codon specifies multiple amino acids

C) Codons specify different amino acids

D) No relation between codons and amino acids

Answer: A) Multiple codons specify same amino acid

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11. Which amino acid is encoded by the codon GUU?

A) Valine

B) Leucine

C) Isoleucine

D) Alanine

Answer: A) Valine

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12. What is the role of tRNA in protein synthesis?

A) Carries amino acid to ribosome

B) Specifies amino acid sequence

C) Synthesizes protein

D) Regulates gene expression

Answer: A) Carries amino acid to ribosome

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13. What is the primary function of ribosomes?

A) DNA replication

B) Protein synthesis

C) RNA transcription

D) Cell signaling

Answer: B) Protein synthesis

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14. Which cellular component contains ribosomes?

A) Nucleus

B) Mitochondria

C) Endoplasmic reticulum

D) Cytoplasm

Answer: D) Cytoplasm

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15. What is the structure of ribosomes composed of?

A) DNA and proteins

B) RNA and proteins

C) Lipids and carbohydrates

D) Only proteins

Answer: B) RNA and proteins

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16. Which of the following is a type of ribosome?

A) 70S

B) 80S

C) 90S

D) 100S

Answer: A) 70S (prokaryotic) and B) 80S (eukaryotic)

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17. What is the role of the small subunit of ribosomes?

A) Decoding mRNA

B) Synthesizing polypeptide

C) Binding amino acids

D) Initiating translation

Answer: A) Decoding mRNA

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18. Which molecule binds to ribosomes during translation?

A) mRNA

B) tRNA

C) rRNA

D) DNA

Answer: A) mRNA

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19. What is the process of protein synthesis called?

A) Transcription

B) Translation

C) Replication

D) Mutation

Answer: B) Translation

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20. Where are ribosomes synthesized?

A) Nucleus

B) Nucleolus

C) Cytoplasm

D) Endoplasmic reticulum

Answer: B) Nucleolus

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21. Which of the following is not a function of ribosomes?

A) Protein synthesis

B) RNA degradation

C) Cell signaling

D) DNA replication

Answer: C) Cell signaling and D) DNA replication

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22. What is the name of the ribosomal subunit that binds to the endoplasmic reticulum?

A) Rough ER

B) Smooth ER

C) Large subunit

D) Small subunit

Answer: A) Rough ER

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23. How many ribosomal subunits are there in prokaryotes?

A) 2

B) 3

C) 4

D) 5

Answer: A) 2 (30S and 50S)

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24. What is the function of ribosomal RNA (rRNA)?

A) Structural component

B) Catalytic activity

C) Messenger RNA

D) Transfer RNA

Answer: A) Structural component

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25. Which of the following best describes a transcription factor?

A) Enzyme that synthesizes RNA from DNA template
B) Protein that binds DNA and regulates transcription
C) Enzyme that degrades mRNA
D) Protein that translates mRNA to protein
Answer: B) Protein that binds DNA and regulates transcription

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26. The TATA box is recognized by which transcription factor in eukaryotes?

A) TFIIA
B) TFIID

C) TFIIH
D) Sigma factor
Answer: B) TFIID

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27. In prokaryotes, which subunit of RNA polymerase is responsible for promoter recognition?

A) Alpha
B) Beta
C) Omega
D) Sigma
Answer: D) Sigma

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28. The formation of the transcription initiation complex in eukaryotes involves:

A) Only RNA polymerase II
B) RNA polymerase II and general transcription factors
C) Ribosomes and tRNA
D) RNA polymerase III only
Answer: B) RNA polymerase II and general transcription factors

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29. Which of the following steps does not occur during transcription initiation in prokaryotes?

A) Binding of RNA polymerase to promoter
B) DNA unwinding at the transcription start site
C) Binding of general transcription factors
D) Formation of open complex
Answer: C) Binding of general transcription factors

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30. During elongation, RNA polymerase moves along the template strand in which direction?

A) 3′ to 5′ direction
B) 5′ to 3′ direction
C) Random direction
D) Both directions simultaneously
Answer: A) 3′ to 5′ direction

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31. In prokaryotic transcription termination, rho-dependent termination requires:

A) Rho protein that acts as a helicase
B) A stop codon
C) Polyadenylation signal
D) TFIIB factor
Answer: A) Rho protein that acts as a helicase

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32. In eukaryotes, which event commonly marks transcription termination?

A) Hairpin loop followed by poly-U sequence
B) Release of sigma factor
C) Cleavage of the transcript and polyadenylation
D) Binding of rho factor
Answer: C) Cleavage of the transcript and polyadenylation

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33. Which factor has helicase activity to help in promoter melting during eukaryotic transcription initiation?

A) TFIIF
B) TFIIE
C) TFIIH
D) TFIID
Answer: C) TFIIH

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34. The main difference between prokaryotic and eukaryotic transcription is:

A) Prokaryotes use multiple RNA polymerases for mRNA synthesis
B) Eukaryotes do not require promoters
C) Eukaryotes require transcription factors and complex machinery
D) Only prokaryotes use sigma factor
Answer: C) Eukaryotes require transcription factors and complex machinery

UNIT-2

1. Which factor initiates translation in prokaryotes?

A) IF-1

B) IF-2

C) IF-3

D) Ribosome

Answer: B) IF-2

2. What is the role of tRNA in translation?

A) Carries amino acids to ribosome

B) Synthesizes polypeptide

C) Decodes mRNA

D) Initiates translation

Answer: A) Carries amino acids to ribosome

3. Which enzyme catalyzes peptide bond formation?

A) Ribonuclease

B) Aminoacyl-tRNA synthetase

C) Peptidyl transferase

D) Helicase

Answer: C) Peptidyl transferase

4. What is the function of elongation factors?

A) Initiate translation

B) Terminate translation

C) Enhance translation rate

D) Inhibit translation

Answer: C) Enhance translation rate

5. Which factor is responsible for termination of translation?

A) Release factor 1 (RF1)

B) Release factor 2 (RF2)

C) Release factor 3 (RF3)

D) All of the above

Answer: D) All of the above

6. What is the role of mRNA in translation?

A) Template for protein synthesis

B) Carrier of amino acids

C) Structural component of ribosome

D) Enzyme for peptide bond formation

Answer: A) Template for protein synthesis

7. Which initiation factor binds to the small subunit of ribosome?

A) IF-1

B) IF-2

C) IF-3

D) IF-4

Answer: C) IF-3

8. What is the function of aminoacyl-tRNA synthetase?

A) Links amino acids to tRNA

B) Synthesizes polypeptide

C) Decodes mRNA

D) Initiates translation

Answer: A) Links amino acids to tRNA

9. Which factor enhances translation fidelity?

A) Proofreading enzyme

B) Editing enzyme

C) Elongation factor

D) Initiation factor

Answer: B) Editing enzyme

10. What is the role of ribosomal proteins in translation?

A) Structural component

B) Catalytic activity

C) Messenger RNA

D) Transfer RNA

Answer: A) Structural component

11. Which factor terminates translation in eukaryotes?

A) eRF1

B) eRF2

C) eRF3

D) All of the above

Answer: D) All of the above

12. What is the function of poly(A) tail in mRNA?

A) Enhances translation

B) Inhibits translation

C) Regulates gene expression

D) Stabilizes mRNA

Answer: D) Stabilizes mRNA

13. What is the primary function of aminoacyl-tRNA synthetases?

A) To synthesize proteins

B) To degrade proteins

C) To attach amino acids to tRNA

D) To detach amino acids from tRNA

Answer: C) To attach amino acids to tRNA

14. Which of the following is a characteristic of aminoacyl-tRNA synthetases?

A) Specificity for one amino acid

B) Specificity for one tRNA

C) Ability to catalyze peptide bond formation

D) Ability to degrade amino acids

Answer: A) Specificity for one amino acid

15. What is the name of the process by which aminoacyl-tRNA synthetases attach amino acids to tRNA?

A) Aminoacylation

B) Peptidyl transfer

C) Translation initiation

D) Translation elongation

Answer: A) Aminoacylation

16. Which aminoacyl-tRNA synthetase is responsible for attaching glutamic acid to its corresponding tRNA?

A) Glutamyl-tRNA synthetase

B) Aspartyl-tRNA synthetase

C) Arginyl-tRNA synthetase

D) Lysyl-tRNA synthetase

Answer: A) Glutamyl-tRNA synthetase

17. What is the role of the 3' OH group of tRNA in aminoacylation?

A) It donates a proton to the amino acid

B) It accepts a proton from the amino acid

C) It forms a covalent bond with the amino acid

D) It recognizes the amino acid

Answer: C) It forms a covalent bond with the amino acid

18. Which of the following is a type of aminoacyl-tRNA synthetase?

A) Class I

B) Class II

C) Class III

D) All of the above

Answer: D) All of the above

19. What is the function of the editing site of aminoacyl-tRNA synthetases?

A) To proofread the amino acid-tRNA complex

B) To hydrolyze incorrectly attached amino acids

C) To enhance aminoacylation

D) To inhibit aminoacylation

Answer: B) To hydrolyze incorrectly attached amino acids

20. Which amino acid is attached to tRNAfMet?

A) Methionine

B) Formylmethionine

C) Alanine

D) Valine

Answer: B) Formylmethionine

21. What is the name of the enzyme responsible for removing the formyl group from fMet-tRNAfMet?

A) Deformylase

B) Formyltransferase

C) Methionyl-tRNA synthetase

D) Peptidyl deformylase

Answer: D) Peptidyl deformylase

22. Which of the following is a consequence of aminoacyl-tRNA synthetase malfunction?

A) Increased protein synthesis

B) Decreased protein synthesis

C) Increased error rate in protein synthesis

D) All of the above

Answer: C) Increased error rate in protein synthesis

23. Which of the following catalyzes the attachment of an amino acid to its tRNA?

A) Peptidyl transferase
B) Aminoacyl tRNA synthetase
C) Ribosomal RNA

D) Release factor
Answer: B) Aminoacyl tRNA synthetase

24. **The process of attaching an amino acid to its correct tRNA is called:**

A) Transamination
B) Aminoacylation
C) Acetylation
D) Phosphorylation
Answer: B) Aminoacylation

25. **tRNA identity is determined mainly by:**

A) Codon recognition site only
B) Anticodon loop and acceptor stem
C) 5′ cap
D) Shine-Dalgarno sequence
Answer: B) Anticodon loop and acceptor stem

26. **In prokaryotes, the small ribosomal subunit recognizes the mRNA by binding to:**

A) Kozak sequence
B) Poly-A tail
C) Shine-Dalgarno sequence
D) TATA box
Answer: C) Shine-Dalgarno sequence

27. **In eukaryotic translation initiation, which factor binds to the 5′ cap of mRNA?**

A) eIF4E
B) eIF2
C) eEF1A
D) eRF1
Answer: A) eIF4E

28. **Which elongation factor helps in bringing aminoacyl tRNA to the A site in prokaryotes?**

A) EF-G
B) EF-Tu
C) EF-Ts
D) RF3
Answer: B) EF-Tu

29. **During peptide bond formation, which enzymatic activity is responsible?**

A) Aminopeptidase activity of EF-Tu
B) Peptidyl transferase activity of large rRNA
C) Helicase activity of ribosome
D) Ligase activity of EF-G
Answer: B) Peptidyl transferase activity of large rRNA

30. **Which factor is required for translocation of ribosome along mRNA in prokaryotes?**

A) EF-Tu
B) EF-G
C) IF-2
D) eRF1
Answer: B) EF-G

31. **In eukaryotes, translation termination requires:**

A) eIF2
B) Release factors eRF1 and eRF3
C) EF-G
D) Shine-Dalgarno sequence
Answer: B) Release factors eRF1 and eRF3

32. **Which of the following is not involved in translation termination?**

A) Stop codon recognition
B) Hydrolysis of peptidyl-tRNA bond
C) Aminoacyl tRNA synthetase activity
D) Release of newly synthesized polypeptide
Answer: C) Aminoacyl tRNA synthetase activity

33. **The first amino acid incorporated in prokaryotic protein synthesis is:**

A) Methionine
B) N-formylmethionine (fMet)
C) Valine
D) Arginine
Answer: B) N-formylmethionine (fMet)

34. **The ribosome binding site in eukaryotic mRNAs is facilitated mainly by:**

A) Shine-Dalgarno sequence
B) 5′ cap structure and Kozak sequence
C) Poly-U tail
D) Internal ribosome entry site only
Answer: B) 5′ cap structure and Kozak sequence

35. **In prokaryotes, initiation of translation involves which factors?**

A) IF-1, IF-2, IF-3
B) eIF1, eIF2, eIF3
C) EF-Tu, EF-Ts, EF-G
D) RF1, RF2, RF3
Answer: A) IF-1, IF-2, IF-3