單選題，共 40 題，每題 2.5 分。考生應作答於答案卡。

1. Which of the following enzymes does NOT require ATP for its reaction?
(A) DNA ligases
(B) RNA polymerase
(C) DNA polymerase
(D) Myosin
(E) None of the above

2. Which of the following statements regarding tRNA is correct?
(A) There are 61 different types of tRNAs.
(B) The acceptor end is on the 5' end.
(C) One tRNA recognized only one codon.
(D) One codon may be recognized by more than one tRNA.
(E) Each tRNA folds into a unique structure for codon recognition.

3. Which of the following is regarded as a ribozyme?
(A) DNA polymerase.
(B) RNA polymerase.
(C) ribonuclease.
(D) lysozyme.
(E) ribosome.

4. In bacteria, which of the following elements defines part of the ribosome binding site?
(A) a promoter
(B) an enhancer
(C) a stop codon
(D) a TATA-containing sequence
(E) a Shine-Dalgarno sequence

5. Which of the following is (are) generally NOT involved during the transcription by RNA polymerase II?
(A) chromatin remodeling complexes
(B) a primer
(C) a topoisomerase
(D) transcription factors
(E) capping enzymes

6. Which of the following can be found in a prokaryotic cell but not in a eukaryotic cell?
(A) Co-transcriptional translation
(B) Co-transcriptional splicing
(C) Co-translational protein folding
(D) Co-translational protein export
(E) None of the above

7. Which of the following is a common feature for DNA and RNA found in the cell?
(A) Formation of the structures.
(B) Use of the bases.
(C) Use of the 5-carbon sugars.
(D) Use of the phosphates.
(E) Stability.

8. One type of virus that infects bacteria is called
(A) a phage.
(B) a bacteria killer.
(C) a lysozyme.
(D) a macrophage.
(E) an antibody.

9. Which of the following translational factors directly recognize a codon on mRNA?
(A) An initiation factor

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(B) An elongation factor
(C) A release factor
(D) A recycling factor
(E) None of the above

10. A tumor-suppressor gene usually function in
(A) induction of cell division.
(B) induction of cell differentiation.
(C) repression of gene expression.
(D) activation of protein synthesis
(E) repair of DNA damage.

11. Which of the following statements regarding viruses is NOT true?
(A) Some prophage genes can cause the transformation of a nonpathogenic bacterium into a form that causes human disease.
(B) An environmental signal may trigger a switch from the lysogenic to the lytic cycle.
(C) The lysogenic cycle always occurs inside of host cells.
(D) The lysogenic cycle typically results in the rapid lysis of all infected cells.
(E) None of the above.

12. Which of the following statements regarding RNA is NOT correct?
(A) RNA uses the sugar deoxyribose.
(B) RNA uses the nitrogenous base uracil.
(C) One RNA molecule can include four different nucleotides in its structure.
(D) RNA molecules have a sugar-phosphate backbone.
(E) RNA can serve as the genome of a virus.

13. Multiple origins of replication on the DNA molecules of eukaryotic cells serve to
(A) remove errors in DNA replication.
(B) create multiple copies of the DNA molecule at the same time.
(C) shorten the time necessary for DNA replication.
(D) assure the correct orientation of the two strands in the newly growing double helix.
(E) assure that the DNA can be replicated.

14. Which of the following is a tRNA-binding site on the ribosome?
(A) M-site.
(B) N-site.
(C) O-site.
(D) P-site.
(E) Q-site.

15. Consider the following sentence: "The dog did not eat." Which of the following variations of this sentence is most like a reading frame mutation?
(A) The did dog not eat.
(B) The dod idn ote at.
(C) The did not eat.
(D) The dog did dog did not eat.
(E) Dog did not eat the.

16. Conjugation, transformation, and transduction are all ways that bacteria
(A) reduce their DNA content.
(B) increase the amount of RNA in the cytoplasm.
(C) infect the host cells.
(D) alter their oxygen requirements.
(E) increase their genetic diversity.

17. Which of the following statements regarding the information flow in the central dogma is NOT correct?
(A) In general, the flow is from DNA to RNA to protein.
(B) In general, if we know the DNA sequence, we can deduce the RNA sequence.
(C) In general, if we know the RNA sequence, we can deduce the DNA sequence.
(D) In general, if we know the protein sequence, we can deduce the RNA sequence.

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(E) In general, if we know the RNA sequence, we can deduce the protein sequence.

18. In a prokaryote, a group of genes with related functions, along with their associated control sequences, defines
(A) an allele.
(B) an operator.
(C) a locus.
(D) a transposon.
(E) an operon.

19. The basis of cellular differentiation is
(A) the operon.
(B) selective gene expression.
(C) cloning.
(D) mutation.
(E) migration.

20. Which of the following permits a single gene to code for more than one polypeptide?
(A) alternative RNA splicing
(B) mutation
(C) genetic differentiation
(D) addition of different types of caps and tails to the final version of the mRNA strands
(E) DNA methylation

21. During DNA replication, the single-strand DNA-binding (SSB) proteins …
(A) are generally found more on the leading strand than the lagging strand.
(B) bind cooperatively to single-stranded DNA and cover the bases to prevent base-pairing.
(C) prevent the folding of the single-stranded DNA.
(D) bind cooperatively to short hairpin helices that readily form in the single-stranded DNA.
(E) All of the above.

22. Which of the following types of noncoding RNA chiefly functions in the processing and chemical modification of ribosomal RNAs (rRNAs)?
(A) Small nuclear RNAs (snRNAs)
(B) Small nucleolar RNAs (snoRNAs)
(C) Small interfering RNAs (siRNAs)
(D) Transfer RNAs (tRNAs)
(E) MicroRNAs (miRNAs)

23. Which of the following statements about microarrays is NOT correct?
(A) Microarrays use specific antibodies to detect the presence of mRNA of each specific gene.
(B) Microarrays enable scientists to determine the activity of thousands of genes at once.
(C) Microarrays use fluorescently labeled cDNA molecules to identify particular genes expressed at a particular time
(D) Microarrays are used to determine which genes are active in different tissues or in tissues of different states of health.
(E) None of the above.

24. Which of the following can NOT be determined by NGS (next-generation sequencing)?
(A) the genome of a cell.
(B) the transcriptome of a cell.
(C) the proteome of a cell
(D) the miRNA of a cell.
(E) the genome of mitochondria.

25. A molecule outside a cell triggers changes in the transcription and translation inside the cell through
(A) metabolic pathways.
(B) signal transduction pathways.
(C) cell junctions.
(D) cytoskeleton reorganization.
(E) chromosome replication.

26. Which of the following statements about proto-oncogenes is NOT correct?

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(A) Proto-oncogenes are normal genes with the potential to become oncogenes.
(B) Many proto-oncogenes code for growth factors.
(C) A mutation occurring in a proto-oncogene can convert it to become an oncogene.
(D) Proto-oncogenes are a type of carcinogens.
(E) None of the above.

27. Which of the following organisms are a major source of restriction enzymes?
(A) Parietal cells
(B) Cancer cells
(C) Archaea
(D) Bacteria
(E) Viruses

28. Which of the following spontaneous lesions in DNA occurs most frequently in a mammalian cell?
(A) Guanine oxidation
(B) Cytosine deamination
(C) Depurination
(D) Guanine alkylation
(E) Depyrimidination

29. The enzyme that converts information stored in their RNA to information stored in DNA is
(A) DNA ligase.
(B) reverse transcriptase.
(C) a restriction enzyme.
(D) RNA polymerase.
(E) a recombinase.

30. A mutation that changes a cysteine codon to a tryptophan codon is called a
(A) nonsense mutation.
(B) missense mutation.
(C) frameshift mutation.
(D) silent mutation.
(E) conditional mutation.

31. A pair of primary and secondary antibodies (Ab) are generally used in a Western blotting experiment. These two antibodies have to come from different sources (e.g., mouse and rabbit), because
(A) Ab from different sources will not compete for the same target.
(B) these two Ab are modified differently.
(C) the secondary Ab recognizes the Fc region of the primary Ab.
(D) the primary Ab is more specific than the secondary Ab.
(E) Ab from the same source will aggregate.

32. Which of the following factors is least important in determine the migration position of DNA on a gel during electrophoresis?
(A) sequence
(B) length
(C) shape (topology)
(D) modification
(E) protein binding

33. RNAi can be used by
(A) researchers to induce the production of more mRNA.
(B) researchers to artificially turn on gene expression.
(C) viruses to stop the production of new proteins.
(D) viruses to increase gene diversity.
(E) cells to prevent infections from double-stranded RNA viruses.

34. Transcriptionally inactive genes
(A) are always located within euchromatin.
(B) are not located within nucleosomes.
(C) often are methylated.

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(D) often are acetylated.
(E) are not resistant to DNase I.

35. Lipid soluble hormones activate transcription by
(A) binding to specific cell-surface receptors.
(B) phosphorylating a protein kinase.
(C) unpacking the nucleosomes.
(D) inhibiting a histone deacetylase.
(E) binding to a nuclear receptor.

36. The branch point A residue involved in lariat formation is part of the
(A) polyA tail.
(B) intron.
(C) exon.
(D) 5′UTR.
(E) 3′UTR.

37. Which type of RNA participates in nuclear export of mRNA?
(A) hnRNA
(B) snRNA
(C) snoRNA
(D) tRNA
(E) rRNA

38. Synthesis of pre-rRNA occurs in the
(A) nucleolus.
(B) endoplasmic reticulum.
(C) ribosome.
(D) cytosol.
(E) nuclear envelops.

39. Which of the following enzymes is generally used in a polymerase chain reaction?
(A) DNA polymerase I.
(B) reverse transcriptase.
(C) Okazaki fragment
(D) Klenow fragment
(E) Taq

40. A DNA repair mechanism is usually activated when the genomic DNA is damaged in a cell. Which of the following enzymes is NOT likely involved in the repair process?
(A) a polymerase
(B) a topoisomerase
(C) an exonuclease
(D) an endonuclease
(E) all of the above are involved

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