

Barcoding Questions v3

Electrophoresis Questions

- Increasing the concentration of agarose in gel electrophoresis will lead to which of the following?
 - Decrease the resolution of low molecular weight DNA fragments
 - Increase the resolution of high molecular weight DNA fragments
 - Decrease the resolution of high molecular weight DNA fragments
 - Require the use of a different conductive medium
 - Increase the resolution of low molecular weight DNA fragments
- A transilluminator is used to:
 - Cross-link DNA to a solid substrate for downstream applications
 - Visualize DNA fragments labeled with SYBR or ethidium bromide
 - Visualize the indicator dye contained in gel loading buffer
 - Visualize DNA under ambient light
 - Move negatively charged DNA fragments through an agarose gel
- Which of the following statements is/are TRUE regarding SYBR (or ethidium bromide)?
 - it is an indicator dye
 - it fluoresces when bound to DNA
 - it migrates toward the negative terminal of the electrophoresis chamber
 - it migrates toward the positive terminal of the electrophoresis chamber
- Which of the following does the DNA loading buffer contain?
 - a DNA carrier
 - a positively charged indicator dye
 - a dye that binds DNA fragments and marks their position in the gel
 - DNA fragments of known size
- Agarose is a:
 - complex polysaccharide derived from marine algae
 - component of a protein complex that binds DNA
 - lipid that forms a porous gel matrix
 - porous gel that is liquid at room temperature
- Which of the following statements is/are FALSE?
 - A DNA ladder contains DNA fragments of known lengths
 - The smallest fragments of a DNA ladder will migrate the slowest through an agarose gel
 - A DNA ladder may be used to estimate the size of a DNA fragment generated by PCR
 - Agarose gel electrophoresis may make use of different conducting media/buffers
- The rate at which DNA fragments migrate through an agarose gel is NOT determined by:
 - amount of voltage applied
 - size of DNA fragments
 - concentration of agarose in the gel
 - size of the gel

DNA Purification Questions

- DNA can be selectively purified from a tissue lysate by:
 - Affinity chromatography to a silica matrix
 - Low-speed centrifugation
 - Chemical separation and decanting
 - Gel electrophoresis
- Silica spin column purification of DNA represents which type of separation method?
 - Thin layer chromatography
 - Southern blotting
 - Mass spectrometry
 - Western blotting
 - Affinity chromatography
- During spin column purification of a PCR product, the DNA may be eluted from the column using:
 - A high salt buffer
 - A low salt buffer
 - Water
 - Ethanol
 - Isopropanol
- Which of the following statements is/are TRUE about Proteinase K?
 - it activates nucleases that degrade DNA or RNA
 - it cleaves phosphodiester bonds
 - it cleaves only terminal amino acids from a protein chain
 - it is catalytically active in the presence of chemicals that denature proteins

Barcoding Questions v3

12. What is the sequence of steps involved in spin column DNA purification from a tissue sample?
- Elute, bind, wash, lyse
 - Bind, lyse, wash, elute
 - Lyse, bind, wash, elute
 - Bind, wash, bind, elute
 - Lyse, elute, wash
13. The purpose(s) of the elution step in spin column DNA purification is/are to:
- Disrupt the anion bridge between DNA and the silica matrix
 - Release the purified DNA from the spin column
 - Remove unbound contaminants from the spin column
 - Equilibrate the silica matrix to promote DNA binding
17. The targeted amplification of a specific DNA fragment by PCR is PRIMARILY a function of:
- denaturation temperature
 - elongation time
 - primer sequences
 - concentration of magnesium
 - denaturation time
18. Which of the following PCR reaction components is/are NOT removed during spin column purification of PCR products?
- dNTPs
 - ddNTPs
 - Taq polymerase
 - gDNA template
19. Which of the following statements is/are TRUE?
- The forward PCR primer binds to the 5' end of the top (sense) strand of the template
 - The reverse PCR primer binds to the 5' end of the bottom (antisense) strand of the template
 - The double stranded PCR product must be converted into single strands before being sent to a facility for sequencing
 - Spin column purification of the PCR product involves cell lysis and DNA elution from a silica column

PCR and DNA Replication Questions

14. Which of the following statements is/are TRUE?
- Okazaki fragments are formed during the replication of the leading (3') strand of DNA
 - DNA replication occurs during S phase of the cell cycle
 - Only the lagging (5') strand of DNA acts as a template during DNA replication
 - Only the leading (3') strand of DNA acts as a template during DNA replication
 - DNA replication occurs during mitosis
15. What is the sequence of cycling steps in a typical PCR reaction?
- Elongation, denaturation, annealing
 - Annealing, denaturation, elongation
 - Denaturation, annealing, elongation
 - Elongation, annealing, denaturation
 - Denaturation, elongation, annealing
16. Which of the following statements is/are TRUE?
- The double stranded PCR product must be converted into single strands before being sent to a facility for sequencing
 - The components of the PCR reaction will interfere with the sequencing reaction
 - Spin column purification of the PCR product involves cell lysis and DNA elution from a silica column
 - The forward PCR primer binds to the 5' end of the top (sense) strand of the template
20. Helicase is an enzyme that:
- separates DNA strands during DNA replication in the cell
 - separates DNA strands during PCR
 - packages DNA into chromosomes
 - disrupts hydrogen bonds between DNA strands during PCR
21. Which of the following statements is/are TRUE?
- Taq polymerase is a heat stable protease
 - Covalent bonds between nucleotides are formed during the annealing step of PCR
 - Hydrogen bonds between complementary DNA strands are broken during the elongation step of PCR
 - The target region defined by the primers begins to accumulate in cycle 3 of the PCR reaction

Barcoding Questions v3

DNA Transcription, RNA, and Mitochondrial Gene Questions

22. Which DNA strand serves as a template to direct mRNA transcription?
- both strands
 - 5' to 3' sense strand of DNA
 - 3' to 5' antisense strand DNA
 - the Okazaki fragment
 - the methylated strand
23. Which of the following distinguish(es) the nucleotide subunits in DNA and RNA?
- Presence of a hydroxyl group at the 3' carbon position of the sugar in a DNA nucleotide subunit
 - Absence of a hydroxyl group at the 2' carbon position of the sugar in a DNA nucleotide subunit
 - Absence of a hydroxyl group at the 3' carbon position of the sugar in an RNA nucleotide subunit
24. What is the complementary strand of the DNA segment 5' ATGCGAAT 3' ?
- 5' TACGCTTA 3'
 - 3' TACGCTTA 5'
 - 3' TAAGCGTA 5'
 - 3' ATTTCGCAT 3'
25. What is the complementary strand of the DNA segment 5' ATTTCGCAT 3' ?
- 5' TACGCTTA 3'
 - 5' TACGCTTA 3'
 - 3' TAAGCGTA 5'
 - 5' ATTTCGCAT 3'
26. What is/are the product(s) of the transcription of the DNA segment: 5' TAGCTTA 3' (sense) 3' ATCGAAT 5' (antisense)?
- 3' AUUCGAU 5'
 - 5' TAGCTTA 3'
 - 3' ATCGAAT 5'
 - 3' UAGCUUA 5'
27. Which of the following statements is/are FALSE?
- mitochondrial protein-coding genes use alternative start codons
 - mitochondrial protein-coding genes use alternative stop codons
 - mitochondrial protein-coding genes lack introns
 - all eukaryotes share the same mitochondrial genetic code
28. For the mRNA transcript 5' AUUCGAU 3', what is the DNA template strand?
- 3' UAGCUUA 5'
 - 3' ATCGAAT 5'
 - 5' TAGCTTA 3'
 - 5' UAGCUUA 3'
29. Which of the following distinguish(es) the nucleotide subunits in DNA and RNA?
- Absence of a hydroxyl group at the 3' carbon position of the sugar in an RNA nucleotide subunit
 - Presence of a hydroxyl group at the 3' carbon position of the sugar in a DNA nucleotide subunit
 - Presence of a hydroxyl group at the 2' carbon position of the sugar in an RNA nucleotide subunit
30. Which of the following statements is/are TRUE?
- mRNA transcripts from mitochondrial genes are modified with a methylated 5' cap
 - mRNA transcripts from mitochondrial genes are modified with a methylated 3' cap
 - mRNA transcripts from mitochondrial genes are polyadenylated
 - the 5' cap signals the ribosome to initiate translation of mitochondrial mRNA
31. Which of the following statements is/are TRUE?
- mRNA transcripts from mitochondrial genes do not contain introns
 - the 5' cap signals the ribosome to initiate translation of mitochondrial mRNA
 - mRNA transcripts from mitochondrial genes are modified with a methylated 5' cap
 - mRNA transcripts from mitochondrial genes are modified with a methylated 3' cap

Barcoding Questions v3

DNA Sequencing Questions

32. Which of the following statements is/are TRUE?
- A. ddNTPs lack a 3' hydroxyl group on the sugar ring
 - B. dNTPs lack a 3' hydroxyl group on the sugar ring
 - C. ddNTPs cannot be added to a growing DNA nucleotide chain.
 - D. dNTPs can be added to a DNA nucleotide chain that terminates in a ddNTP subunit.
 - E. ddNTPs exist in nature
33. With respect to dideoxy chain termination sequencing, which of the following is FALSE?
- A. The forward sequencing primer binds to the 5' end of the antisense strand
 - B. 2 primers are used per reaction
 - C. The reverse sequencing primer binds to the 5' end of the sense strand
 - D. The forward sequencing reaction will determine the nucleotide sequence of the sense strand
 - E. ddNTPs are added in excess to dNTPs
34. A dideoxy chain termination sequencing reaction does NOT contain which of the following components:
- A. dNTPs
 - B. ddNTPs
 - C. a DNA template
 - D. both forward and reverse primers
 - E. a heat stable DNA polymerase
37. What is the relationship between a reference barcode sequence and a query barcode sequence?
- A. A query is compared against other queries to determine the specimen ID
 - B. A reference is compared against queries to determine the specimen ID
 - C. A query is compared against references to determine the specimen ID
 - D. A reference is compared against other references to determine the specimen ID
38. A goal of the Barcode of Life initiative is to provide coverage for _____ species of plants and animals by 2015?
- A. 100,000
 - B. 250,000
 - C. 500,000
 - D. 1,00,000
39. The Barcode of Life is primarily interested in what kinds of organisms?
- A. Fish
 - B. Vertebrates
 - C. Vertebrates and plants
 - D. Fish and Bacteria
 - E. Eukaryote plants and animals
40. How large is the DNA segment targeted for studies with the COI gene?
- A. 350 bases
 - B. 450 bases
 - C. 550 bases
 - D. 650 bases

Barcode Questions

35. The International Nucleotide Sequence Database Collaboration (INSDC) does NOT include which of the following data repositories?
- A. DNA Data Bank of Japan
 - B. Barcode of Life Data Systems
 - C. GenBank
 - D. European Nucleotide Archive
36. Which gene is used to identify vertebrate species with DNA Barcoding?
- A. VDG (vertebral differentiation gene)
 - B. COI (cytochrome C oxidase subunit I)
 - C. rbcL (ribulosebisphosphate carboxylase)
 - D. matK (maturase K)