

BMB/MICRB 251 – October 21, 2002 - Exam 2

- Use #2 pencil. Answer all questions on the enclosed optical read form.
- There is only one answer for each question.
- Read the question carefully and choose the best answer.
- Write your name and student I.D. number and fill in the corresponding oval.
- Be sure that your TEST FORM letter matches you EXAM FORM letter.
- This is EXAM FORM **B**
- There are 33 questions. The exam ends at 1:10 pm

1	<p>What is the purpose of the yeast two hybrid assay?</p> <p>A. Measure protein-protein interactions in vivo</p> <p>B. Perform Southern blots on chromosomal DNA</p> <p>C. Identify open reading frames (ORFs)</p> <p>D. Measure the growth rate of yeast cells.</p> <p>E. Propagate recombinant plasmids using an ampicillin resistance gene.</p>
2	<p>The eukaryotic translation release factor (eRF) looks like what?</p> <p>A. Amino acyl tRNA synthetase</p> <p>B. tRNA</p> <p>C. rRNA</p> <p>D. mRNA</p> <p>E. the small ribosomal subunit</p>
3	<p>Topoisomerases can play positive roles in gene expression by</p> <p>A. Separating DNA strands during transcription initiation.</p> <p>B. Helping proteins fold properly.</p> <p>C. Bending DNA so that distantly-bound gene regulatory proteins can interact with RNA polymerase II.</p> <p>D. Stimulating both polyadenylation and capping of RNA transcripts.</p> <p>E. Relieving superhelical twists in the DNA that are generated ahead of the transcribing RNA polymerase.</p>
4	<p>During times of moderate stress (e.g., heat shock) proteins can denature or unfold. What kind of genes might be turned on under such stress conditions that would help the cell survive?</p> <p>A. Genes coding for glycolysis enzymes</p> <p>B. Genes coding for molecular chaperones</p> <p>C. Genes coding for RNA polymerase II</p> <p>D. Genes coding for ribosomal subunits</p> <p>E. Genes coding for cell differentiation molecules</p>
5	<p>Which is NOT true?</p> <p>A. Capping of mRNA transcripts protects the mRNA from nucleases.</p> <p>B. mRNA caps are recognized by components of the translation machinery.</p> <p>C. Polyadenylation occurs at the 3' end of mRNA</p> <p>D. Polyadenylated mRNA is recognized by components of the translation machinery.</p> <p>E. Capping of mRNA occurs at the mRNA 3' end, and occurs after cleavage and polyadenylation of the transcript.</p>

6	<p>What enzyme is directly responsible for making the polyA tail on mRNA?</p> <ul style="list-style-type: none"> A. RNA polymerase I B. RNA polymerase II C. RNA polymerase III D. PolyA polymerase E. Telomerase
7	<p>How many nucleotides are traversed (traveled across) during each peptidyltransferase reaction of translation.</p> <ul style="list-style-type: none"> A. 0 B. 1 C. 2 D. 3 E. 4
8	<p>Alzheimer's disease is caused by</p> <ul style="list-style-type: none"> A. Aggregation of proteins B. Out of frame translation C. Senility D. Improper transcription of Alzheimer genes E. Ribozymes
9	<p>What do transcriptional activators do?</p> <ul style="list-style-type: none"> A. They bind to specific DNA sequences and help assemble the transcription complex. B. They stimulate translation. C. They direct RNA splicing. D. They remodel chromatin into a 30 nm repressive fiber. E. They have both helicase and kinase activity, which is essential for transcription.
10	<p>Which is NOT a means by which proteins or gene are generally regulated?</p> <ul style="list-style-type: none"> A. Subcellular localization, such as in the nucleus vs. the cytoplasm. B. Translation of the mRNA C. Alternative splicing of exons D. Phosphorylation of the protein E. DNA replication of the gene
11	<p>Which one of the following are you likely to find as a common component of the yeast two hybrid assay?</p> <ul style="list-style-type: none"> A. Helix-turn-helix domain B. Mitochondrial proteins C. Ribosomal RNA D. snRNA E. Chromatin remodeling complexes
12	<p>What is the theoretical progression limit of nucleic acid amplification by PCR (polymerase chain reaction)?</p> <ul style="list-style-type: none"> A. 1, 2, 3, 4, 5, 6, ... B. 2, 4, 6, 8, 10, 12, C. 1, 10, 100, 1000, 10000, 1000000, ... D. 1, 2, 4, 8, 16, 32, ... E. 2, 4, 24, 96, 384, 1024, ...

13	<p>Why would you fuse the coding sequence for a series of histidines (polyhistidine tract) in frame with a particular gene?</p> <ul style="list-style-type: none">A. It allows the gene to be induced.B. It protects the resulting protein from degradation.C. It facilitates the purification of the protein when using a nickel affinity chromatography resin.D. It allows the protein to fluoresce.E. It facilitates the transcription and translation process.
14	<p>Gel electrophoresis separates proteins and nucleic acids using what principle?</p> <ul style="list-style-type: none">A. Gel filtration chromatographyB. Ion exchange chromatographyC. Affinity chromatographyD. Migration of charged molecules in an electric fieldE. The photo-voltaic effect
15	<p>RNA splicing involves</p> <ul style="list-style-type: none">A. removal of introns from the mRNA transcript via a spliceosomeB. removal and degradation of exons from the mRNA transcript.C. cleavage and polyadenylation of the mRNA transcriptD. reverse transcriptase.E. the splicing or attachment of introns to exons.
16	<p>Which of the following processes is directed primarily by proteins rather than RNAs</p> <ul style="list-style-type: none">A. translation of mRNAB. splicing of mRNA by snRNPsC. chemical modification of ribosomal RNAD. cleavage and polyadenylation of the mRNA transcriptE. telomere maintenance via telomerase
17	<p>Why is the major groove of DNA preferred over the minor groove for protein binding?</p> <ul style="list-style-type: none">A. The minor groove is too narrow to bind protein.B. The major groove provides a unique arrangement of hydrophobic interactions and van der Waals interactions that the minor groove does not provide.C. The major groove provides a more diverse arrangement of hydrogen bond donors and acceptors which provide greater specificity.D. The minor groove has too many repulsive ionic interactions.E. DNA does not have a minor groove, so proteins can only bind to the major groove.
18	<p>As an X-ray crystallographer what do you do?</p> <ul style="list-style-type: none">A. Study geochemical processesB. Perform medical diagnosesC. Determine the structure of proteinsD. Clone genesE. Perform bioinformatic analyses of microarray data.

19	<p>You have just isolated and determined the nucleotide sequence of a novel gene in <i>Drosophila</i> (fruit fly). How might you quickly determine whether an ortholog exists in humans?</p> <p>A. Make crude extracts of human cells and purify the gene. B. Clone the human gene by ligating it into a plasmid and selecting for ampicillin resistance. C. Generate a transgenic mouse lacking the gene. D. Create a genomic library from human cells and determine if it can transform <i>Drosophila</i> cells. E. Perform a BLAST search.</p>
20	<p>The tryptophan (Trp) repressor is an example of negative regulation. How does it work? (Key words are boldfaced)</p> <p>A. Tryptophan binds to the Trp repressor, causing a repositioning of alpha helices that allow it to bind to the Trp operator and block RNA polymerase access to the tryptophan biosynthetic genes. B. Cyclic AMP binds to the Trp repressor, causing a repositioning of alpha helices that allow it to bind to the Trp operator and block RNA polymerase access to the tryptophan biosynthetic genes. C. Tryptophan binds to the Trp repressor, causing a repositioning of alpha helices such that it can no longer bind to the Trp operator. This allows RNA polymerase to access the tryptophan biosynthetic genes. D. Cyclic AMP binds to the Trp repressor, causing a repositioning of alpha helices such that it can no longer bind to the Trp operator. This allows RNA polymerase to access the tryptophan biosynthetic genes. E. The tryptophan biosynthetic genes are subjected to positive regulation, not negative regulation.</p>
21	<p>The field of study that attempts to isolate (or purify) proteins from a crude cell extract, and perform in vitro assays on the protein to study its enzymatic function is best described as...</p> <p>A. Genetics B. Biochemistry C. Cytology D. Genomics E. Economics</p>
22	<p>A polyclonal antibody is to a Western blot, as a _____ is to a Northern blot.</p> <p>A. Monoclonal antibody B. mRNA C. Oligonucleotide probe D. Chromosome E. tRNA</p>
23	<p>Translation is carried out by what specific complex?</p> <p>A. Ribozyme B. Translationase C. Telomerase D. Ribosome E. Nucleosome</p>

24	<p>EcoRI is a very commonly used restriction endonuclease. Which is likely to be its recognition sequence and cut site? (Shown are possible 6-base pair recognition sites, where the cut site is indicated by a slash “/”)</p> <ul style="list-style-type: none">A. G/AATTC CTTAA/GB. GC/ATGC CG/TACGC. GG/AAGG CCTT/CCD. G/GATC/C C/CTAG/GE. CCAAT/G G/GTTAC
25	<p>p53 is a tumor-suppressor gene. How would you go about determining whether or not p53 is expressed in tumor cells and healthy cells.</p> <ul style="list-style-type: none">A. Perform a Southern blot on chromosomal DNA from these cells.B. Perform a Northern blot on mRNA isolated from these cells.C. Perform an Eastern blot using the yeast two hybrid assay.D. Clone the p53 gene.E. Perform a co-immunoprecipitation of the p53 protein and look for associated proteins.
26	<p>Where is the transcriptional start site on the lacZ gene?</p> <ul style="list-style-type: none">A. -10B. -1C. 0D. +1E. +30
27	<p>Which is true?</p> <ul style="list-style-type: none">A. RNA polymerase II polymerizes RNA in the 3' to 5' direction.B. RNA polymerase II utilizes deoxyribonucleotide triphosphates as substrates.C. Transcription initiation requires an RNA primer, made by primase.D. A gene can be transcribed repeatedly by RNA polymerase IIE. RNA polymerase II synthesizes tRNAs.
28	<p>Where in the cell does the vast majority of translation take place?</p> <ul style="list-style-type: none">A. NucleusB. CytoplasmC. Extracellular matrixD. MitochondriaE. Cell membrane

29	<p>How are particular tRNAs charged with the correct amino acid?</p> <ul style="list-style-type: none">A. DNA ligase attaches the correct amino acid to the correct tRNAB. Aminoacyl tRNA synthetase recognizes the anticodon.C. Codons-anticodon interactions align the correct amino acid with the correct tRNA.D. tRNAs are synthesized together with the correct amino amino by RNA polymerase IIIE. tRNAs get translated to make the correct charging of the amino acid.
30	<p>Which is correct?</p> <ul style="list-style-type: none">A. There are 20 different codons that code for 20 amino acids.B. There are 61 different codons that code for 20 amino acids.C. There are 20 different codons that code for 51 amino acids.D. There are 64 different codons that code for 20 amino acids.E. There are 37 different codons that code for 51 amino acids.
31	<p>Which is not a type of cellular RNA?</p> <ul style="list-style-type: none">A. messenger RNA (mRNA)B. transfer RNA (tRNA)C. translational RNA (tnRNA)D. ribosomal RNA (rRNA)E. small nuclear RNA (snRNA)
32	<p>What recognizes the -10 and -35 region of bacterial promoters?</p> <ul style="list-style-type: none">A. Sigma factorB. TFIIDC. RNA polymerase IID. eEF-TUE. Lac repressor
33	<p>What happens to the carboxy terminal domain (CTD) of RNA polymerase II during transcription initiation?</p> <ul style="list-style-type: none">A. It gets methylated by CTD methylaseB. It gets phosphorylated by TFIIH.C. It gets proteolyzed (degraded by proteases).D. It binds to alpha factors.E. It gets translated into a heptad repeat, that is repeated 52 times in humans.