

BMB/MICRB 251 - September 23, 2004 - Exam 1

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	Which biomolecule has both catalytic activity and an ability to store genetic information? A. DNA B. protein C. ATP D. RNA E. carbohydrates
2	During DNA replication, what part of the growing polynucleotide chain makes a nucleophilic attack on an incoming nucleotide triphosphate A. base B. 2' OH C. 3' OH D. phosphate E. 5' OH
3	The movement of retrotransposons around the genome involves A. homologous recombination B. transposases C. packaging into retroviruses D. cutting and re-ligating a DNA intermediate E. an RNA intermediate
4	Which functional groups form ionic interactions with each other? A. methyl and phosphates B. phosphates and amines C. carboxylates and phosphates D. hydroxyl and hydroxyl E. sulfhydryl and hydroxyl
5	Which best describes the interior of a protein? A. oily B. crunchy C. rigid D. acidic E. soapy
6	Which is NOT a property of enzymes A. The same enzyme can catalyze both the forward and reverse reaction. B. Enzymes alter the reaction equilibrium. C. Enzymes do not get used up in the reaction it catalyzes. D. Enzymes react with only specific substrates. E. Enzymes accelerate the rate of a reaction.

7	<p>Which sequence is the most distantly related from the others (in terms of evolutionary time):</p> <p>A. ACCGCTCTGATCGCTGCTGCTA B. ACCGCTCAGTGGCTGATGCTA C. AGCAGTCTGAGACCATTAGGCC D. ACCGCTCTGATCGCTGATGCTA E. ACCGCTCTGATCGCTGCTGCTA</p>
8	<p>What is the molecular basis for achieving “gene conversion” compared to “crossing over” during homologous genetic recombination?</p> <p>A. Alternative resolution of Holliday junctions B. 3’ to 5’ exonuclease proofreading activity C. Nucleosomal modification by the Ruv proteins D. Sister chromatid exchange during meiosis E. Nucleotide excision repair</p>
9	<p>Which is not a property of DNA?</p> <p>A. sugar B. purine base C. phosphodiester bonds D. peptide bond E. acid</p>
10	<p>What is the basis by which enzymes lower activation energies of chemical reactions?</p> <p>A. reaching V_{max} B. converting substrate to product C. undergoing allosteric regulation D. binding of a ligand E. stabilization of the transition state</p>
11	<p>A cell is bombarded with ultraviolet light. What process is likely to stop?</p> <p>A. DNA repair B. cell cycle C. homologous recombination D. DNA transposition E. ATP hydrolysis</p>
12	<p>Conversion of 10 nm chromatin fibers to 30 nm fibers involves what protein?</p> <p>A. DNA polymerase B. histone H1 C. Rad51 D. Xhn22 E. histone acetyltransferases</p>
13	<p>What do helicases break?</p> <p>A. the DNA phosphate backbone B. protein secondary structure (i.e. alpha helices) C. hydrogen bonds between DNA strands D. ionic interactions between DNA strands E. acid anhydride linkages</p>

14	<p>What is the purpose of the clamp associated with DNA polymerase?</p> <p>A. Stops DNA polymerase from re-replicating DNA</p> <p>B. Enhances primase activity</p> <p>C. Stops DNA polymerase from dissociating from DNA during DNA polymerization</p> <p>D. Helps remove Okazaki fragments</p> <p>E. It directs lagging strand synthesis</p>
15	<p>Horizontal gene transfer involves the movement of DNA from</p> <p>A. parent to offspring</p> <p>B. the mitochondria to the nucleus</p> <p>C. within the same genome via transposons</p> <p>D. one related or unrelated organism to another</p> <p>E. the nucleus to the mitochondria</p>
16	<p>Which of the following sequences will hybridize to this sequence: 5' -AAAGGCGCAACATA-3' ?</p> <p>A. 5' -AAAGGCGCAACATA-3'</p> <p>B. 5' -TATGTTGCGCCTTT-3'</p> <p>C. 5' -TTCCGCGTTGTAT-3'</p> <p>D. 5' -GTCCGTAGTGAAGT-3'</p> <p>E. 5' -ATACAACGCGGAAA-3'</p>
17	<p>Which are features of eukaryotic chromosomes?</p> <p>A. linear with one centromere and two telomeres</p> <p>B. circular with a single origin of replication</p> <p>C. linear with a single origin of replication</p> <p>D. circular with multiple origins of replication and one centromere</p> <p>E. linear with two centromeres and one telomere</p>
18	<p>Why do somatic cells lack telomerase?</p> <p>A. To help limit uncontrolled proliferation of cells, which die when telomere shortening after repeated cell divisions leads to loss of genetic information</p> <p>B. Since they are rapidly dividing cells they do not need to provide long term stabilization of their telomeres</p> <p>C. To prevent uncontrolled transposition of retrotransposons</p> <p>D. Somatic cells lack telomeres and thus do not need telomerase.</p> <p>E. During cell division chromosomes condense, and this involves the binding of telomere binding proteins, which prevents the association of telomerase. Thus telomerase is not needed in somatic cells.</p>
19	<p>What protein complex checks for mis-incorporation of the wrong nucleotide during DNA replication?</p> <p>A. mismatch repair complex</p> <p>B. nucleotide excision repair complex</p> <p>C. base excision repair complex</p> <p>D. recA protein</p> <p>E. DNA primase</p>
20	<p>A protein domain is</p> <p>A. an independent folding unit of a protein</p> <p>B. a short peptide that possesses secondary structure</p> <p>C. an active site of an enzyme</p> <p>D. the subcellular localization of the protein</p> <p>E. the three dimensional arrangement of amino acids in the protein</p>

21	<p>What role do chromatin remodeling complexes play in gene control?</p> <p>A. They bind to DNA and directly block other regulatory proteins from binding. B. They alters the DNA path along nucleosomes, thereby altering DNA accessibility. C. They are responsible for phosphorylating the gene. D. They are directly involved in DNA strand separation during DNA replication. E. They are allosteric regulators of DNA polymerase.</p>
22	<p>Which represents life's major evolutionary domains?</p> <p>A. Plants, animals, fungi, protists, bacteria B. Homo sapien, Homo erectus, Neanderthal, chimpanzee C. Humans, mice, flies, yeast, bacteria D. Eukaryotes, arachaea, bacteria E. Plants, animals, fungi, protists, archaea</p>
23	<p>What type of bond or interaction is the weakest?</p> <p>A. hydrogen B. covalent C. ionic D. van der Waals E. hydrophobic</p>
24	<p>Which of the following is NOT a property of at least some proteins?</p> <p>A. They bind to metals B. They catalyze chemical reactions C. They are composed mainly of fatty acids and form lipid bilayers D. They have a unique three dimensional shape. E. They are regulated by covalent modifications such as phosphorylation.</p>
25	<p>Which term is not of similar meaning as the others?</p> <p>A. synapsis B. heteroduplex C. hybridization D. reanneal E. homolog</p>
26	<p>When a nucleotide is mis-incorporated during DNA replication in E. coli, how does the cell's post-replication DNA repair machinery know which is the incorrect nucleotide? That is, how does it know parent from daughter?</p> <p>A. The daughter strand is temporarily phosphorylated, which serves as a marker or DNA repair. B. It removes both, thereby eliminating the problem C. It detects methylated DNA as the parental strand. D. It conducts homologous recombination to repair both strands. E. The daughter strand is detected as being new, and thus most likely to have incorporated the mistake.</p>
27	<p>Identify the paralogous genes</p> <p>A. Human hemoglobin alpha and Chicken hemoglobin alpha B. Yeast ADH1 and ADH2 (ADH1 and ADH2 both code for slight different version of alcohol dehydrogenase) C. Drosophila UBX and ADH1 (genes that code for a transcriptional regulatory protein and alcohol dehydrogenase, respectively) D. Mouse hemoglobin alpha and bacterial recA E. E. coli recA and recB (code for two different proteins that are involved in recombination)</p>

28	<p>Allosteric regulation of aspartate transcarbamoylase results in what?</p> <p>A. a conformational change in the enzyme B. transcriptional activation of its gene C. enhanced conversion of substrate to product D. transfer of a carbonate to aspartate E. enhanced conversion of product to substrate</p>
29	<p>How does acetylation of the amino terminal tails of histones regulate gene expression?</p> <p>A. Acetylated lysines are unable to be phosphorylated which leads to transcriptional activation B. It causes phosphorylation of the gene which activates the gene C. Acetylated lysines increase accessibility of the DNA and also bind to certain transcription proteins D. It cause the tail to “wag” and the histone head to “bark” E. It causes DNA replication to stall at genes</p>
30	<p>During DNA replication why is there lagging strand synthesis?</p> <p>A. Because DNA ligase can seal nicks in the DNA. B. Because of nucleotide misincorporation which needs to be corrected, and this takes a long time. C. Because DNA primase makes an RNA primer. D. Because DNA polymerase cannot polymerize DNA in the 5' to 3' direction. E. Because DNA polymerase cannot polymerize DNA in the 3' to 5' direction.</p>
31	<p>Which is the major type of interaction that promotes the binding of glucose to hexokinase?</p> <p>A. ionic interactions B. hydrophobic interactions C. hydrogen bonding D. covalent bonding E. Pi bonding</p>
32	<p>Where does the phosphate on a phosphoprotein come from?</p> <p>A. GTP B. CTP C. ATP D. NADPH E. P_i (inorganic phosphate)</p>
33	<p>Which element would you expect NOT to find in a protein?</p> <p>A. carbon B. nitrogen C. oxygen D. hydrogen E. silicon</p>